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THE ELECTRIC CLUB'S NEW YEAR.

THE ELECTRICAL FRATERNITY AND THEIR FRIENDS EXCHANGE GREETINGS AT THE CLUB HOUSE—MUCH INTEREST EXPRESSED IN THE COMING MEETINGS OF THE CLUB.

Very graceful announcements sent out by the Electric Club of this city stating that the Club house would be open Jan. 1st, was responded to by the presence of a large number of the members of the Club and their friends. The cards were elegantly engraved, and under the heading of "The Electric Club, Jan. 1st, 1890," read as follows: "Members and their friends will meet at the Club house to exchange New Year's greetings from 2 to 10 P. M." Before 2 o'clock in the afternoon the members had commenced to arrive, and were coming and going all afternoon and evening. The occasion was in every way a very pleasant one. The lunch provided by the committee was pronounced a great success, as was also the punch which was served in the Club's handsome silver punch bowl, a gift from Captain H. R. Garden.

Several gentlemen from Boston and other cities were present, and telegrams bearing the compliments of the season were received from a number of out of town members.

Prof. Geo. Forbes, of England, the eminent electrical engineer, was a visitor at the Club and will remain in the United States a few weeks. Messrs. W. D. Sargent, J. D. Bishop, W. J. Hammer and others, who have recently returned from the Paris Exposition, were present, and were prevailed upon to relate some of their experiences on the other side. As these experiences lost nothing in the telling of them, they were greatly enjoyed by all the listeners. A number of the members assisted in making the occasion pleasant by supplying the music, both instrumental and vocal, one of the choicest things being a song rendered by Mr. F. Z. McGuire, composed by himself.

President Madden was congratulated on the auspicious inauguration of the New Year by the Club and on the evident interest displayed in its work.

The lecture for this month (Jan. 16th), is by Prof. Cross, of the Massachusetts Institute of Technology, and promises to be one of the most largely attended lectures of the Club. The title of Prof. Cross's address is "The Acoustic Principles Underlying the Art of Telephony," and his well known familarity with this subject assures every listener a rare treat.

The lecture for February 20th will be by the Hon. Grosvenor P. Lowrey, and is entitled "Patent Law and What Constitutes an Invention." Mr. Lowrey's eminence in the field of patent law is so well known in electrical circles that he is certain of a very large audience, which, it is safe to predict, will be most highly entertained and instructed.

ELECTRICITY IN THE CENSUS.

The following has been sent out from the Department of the Interior, Census Office, Washington, D. C., under date of December 4, 1889:

To all persons interested in the electrical industry:

I beg to inform you that under the authority conferred by the act of Congress entitled "An act to provide for taking the Eleventh and subsequent censuses," approved March 1, 1889, Mr. Allen R. Foote, of Cincinnati, Ohio, Chairman of the Committee on Data and of the National Committee on State and Municipal Legislation of the National Electric Light Association, has been appointed special agent of the census office to have charge of the collection of statistics of the electrical industry. The special agent is authorized to conduct in his own name correspondence relating to this industry, and, under the direction of the superintendent of census, to pursue special inquiries into the condition and tendency of the industry placed in his charge.

It is the purpose of this office, without seeking data which may be irrelevant or unimportant, to make the statistics of this industry complete and accurate, so that its real condition and true importance may be known and understood by the general public. It is confidently believed that those who are to derive the chief benefit from the result of the inquiry, viz: manufacturers and central station companies engaged in the distribution of electric currents for the commercial uses of light and power, will lend their cordial aid to render that result full and reliable. A formal response to the questions of the schedule is all that can be insisted upon, but the superintendent solicits beyond this the hearty co-operation of all persons interested in respect to furnishing information promptly and accurately, in the procurement of additional facts, and in the suggestion of pertinent and useful lines of investigation. Without such co-operation, intelligently supplied, the inquiry must of necessity be limited in its value.

All persons to whom inquiries may be addressed are assured that this office will faithfully observe the requirements of law relative to answers to census inquiries being treated as strictly confidential. Each employé of the census office specifically makes oath not to disclose improperly that which he ascertains, and severe penalties are imposed for a violation of the obligation to secrecy. Consequently, all persons addressed may have confidence that their compliance with the request for information as to certain details of their business will in no case be followed, either in the report of the special agent or in the tabulation of results, by the disclosure of matters which they properly desire to withhold from publicity.

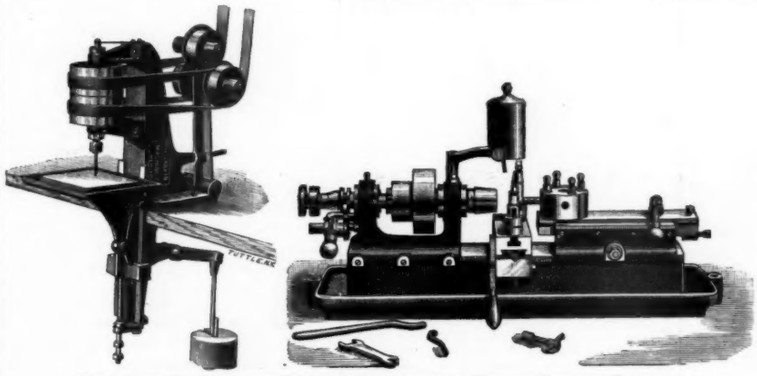
The census of 1880 makes no mention of the industry of generating and distributing from central stations electric currents for uses of light and power. The investigation of this industry for the eleventh census will be the first official census report made on the subject in this or any other country. For this reason it is particularly desirable and essential that the investigation shall not only present a correct record of the industry as it exists to-day, but that it shall so classify and arrange the information as to render it serviceable as a basis for present action and of comparison for all future reports. In view of these facts, the importance and value of such an investigation and the official publication of its results should in itself be sufficient to secure from every person addressed a special effort to answer fully and promptly every inquiry. The exhibition of the birth of an industry and its growth to the magnitude of an interest second to none in importance within the short space of a single decade is a marvellous record of progress. In no other industry and in no other country has such a record ever been made. Very respectfully,

ROBERT P. PORTER,
Superintendent of Census.

Some New Machine Tools.

We illustrate this week some of the smaller machine tools made by the Garvin Machine Company, of New York City. The tapping machine is known as the No. 0 vertical tapper, shown in Fig. 1, and embodies a number of important features. A continuous belt drives the spindle in either direction by means of two friction clutches, which are alternately engaged by the pressure of the work on the tap. The movement necessary to a reversal of the motion of the tap is but about 1.32 of an inch, and very little force is required as the spindle is counter-balanced by the spring shown at the top. The table is operated by a treadle attached to the rod, to which a counter weight is fastened. This arrangement leaves the hands entirely free to manipulate the work, and insures quick and accurate tapping. The belt can be tightened by the set screw in the hinged stand carrying the idler pulleys.

Adjustable stops are provided for limiting the motion of the table in either direction, and the table has an oil groove entirely around it for the reception of the oil in tapping.



FIGS. 1 AND 2.—IMPROVED MACHINE TOOLS OF THE GARVIN MACHINE COMPANY.

About uniform in capacity with the No. 0 vertical tapper is the No. 00 screw machine, shown in Fig. 2. Although of small size, it retains all the features of the larger machines of its type, including the spring chucks and wire feed. The turret is provided with the usual automatic revolving motion, and the locking device is simple and durable. The turret slide and cross slide also are moved by levers, giving a very sensitive feed, which is important in using small tools.

The machine is intended to be mounted on the bench on account of the advantage in light. These machines are meeting with much favor in electrical manufacturing circles.

A Standard Wiring Table.

At the December meeting of the Council of the American Institute of Electrical Engineers, a committee of members was appointed to formulate and submit for approval a standard wiring table for lighting and power purposes. The committee consists of F. B. Crocker, chairman, Thomas P. Conant, Dr. Louis Duncan, Prof. W. E. Geyer, A. E. Kennelly, Geo. B. Prescott, Jr., Prof. E. P Roberts, William Stanley, Jr., Dr. Schuyler S. Wheeler.

The first meeting of this committee is called to meet at the rooms of the Institute, 125 Temple Court, on Friday, January 10, 1890.

It is not intended to make any radical departure from the best practice of to-day, but rather to establish a table which shall be generally recognized and used as a standard. Any suggestions from persons interested in this matter will be welcomed. Address communications to F. B. Crocker, Columbia College, New York City.

Electric Lighting in Cincinnati.

The introduction of electric lighting in the city of Cincinnati is a consummation which, having been desired for so many months past, has resulted in a lively competition among the various electric light companies throughout the country, and is likely to be realized soon by the development of one of the best central station plants in the United States. Cincinnati has been struggling for years to secure the lighting of the streets in a manner more modern and satisfactory than has been afforded by the dull glare of the sickly coal-gas lamps.

The Thomson-Houston Company, with their usual push and energy, have stepped into the field and taken hold of the matter in a manner which has won the confidence of the promoters of the scheme and of the general public. This company is erecting a plant on Broadway between Hunt and Court streets. The location is a little northeast of the center of the city, but is all the more desirable on this account. The ground on which the station is being built recedes from Broadway, which will enable the architect to put in two entrances, one a story below the other. The building is 100 feet front by 165 feet deep, and will be constructed entirely of stone, brick and iron, making it fire-proof as nearly as possible. In a few days it will be under roof, and the work of placing the machinery will be pushed forward with great rapidity. This large station will supply the city with arc and incandescent lights and with motive power.

When this plant is fully equipped it will be one of the largest, and most perfect in all its appointments of any electric light plant in the country. On the rear end is to be placed the boiler-house, which is to be started with eight tubular steel boilers, set in a novel manner. It is claimed by the inventor that it comes nearer attaining a complete consumption of coal than any system of boiler-setting now in use, and that when these eight boilers are in full operation the amount of smoke will be scarcely discernible. Next to the boiler-house will be the engine and dynamo room, which is 100 feet in width by 110 feet in length. In this room will be placed large Corliss compound condensing engines and Thomson-Houston dynamos.

The front on Broadway will be three stories high, embracing warerooms, supply departments and offices for the company. It is claimed that this plant, when fully equipped, will have a capacity of about 2,000 to 2,500 horse-power, which will be sufficient to light the entire city, besides furnishing a large amount of commercial lighting and motive power.

Owing to the very limited facilities for electric lighting in Cincinnati at present, it is a fact that there is not a single residence in the city or suburbs lighted by electricity. This is a startling assertion to make of a city of more than 350,000 inhabitants, and yet throughout the State of Ohio nearly all the towns of 3,000 inhabitants and upwards enjoy the luxury of the electric light in private residences.

Electricity at the Boston Maritime Exhibition.

The Christmas tree at the Maritime Exhibition is a very large one, and makes a beautiful appearance, illuminated as it is by 165 Thomson-Houston incandescent lamps.—A model of the Kryger steam snow shovel is run by a "C. & C." motor.—The Thomson-Houston electric hoist is attracting considerable interest, as it is the first machine of the kind built. The one on exhibition has been sold to Garfield & Proctor, of New Bedford, who will use it in unloading coal from barges and transferring it to breakers. Six more hoists have been ordered by various parties, and a wide field seems to be at their disposal. The electric hoist exhibit has been surrounded by a railing, on which are placed various colored incandescent lamps. These lamps are run by a current from a Thomson-Houston dynamo which is run by a Thomson-Houston motor. It is a significant fact that no steam plant of any description is to be seen in connection with this exhibit.—C. H. McKenney & Company show some very handsome examples of electroliers.—A three horse-power Thomson-Houston motor runs a line of shafting which furnishes power for two silk looms, and another of larger size runs the *Daily Advertiser* press, a blower and a silk loom.—In the basement a T.-H. incandescent machine gives current for the search light on top of the building. This dynamo is connected to a Westinghouse engine by means of the Evans' friction gearing.—The New England Phonograph Company have a very interesting exhibit of phonographs and phonograph-graphophones, which is almost always surrounded by an eager crowd.—The Crosby Steam Gauge and Valve Company have a large exhibit of their gauges, valves and steam whistles.

The Temperature of the Moon.

FROM STUDIES AT THE ALLEGHENY OBSERVATORY, BY S. P. LANGLEY.

The principal method employed in the present research for determining the temperature of the surface of the moon is founded on the fact, already experimentally established by the writer, that the position of the maximum in a curve, representing invisible radiant heat, furnishes a reliable criterion as to the temperature of the radiating (solid) body, and on the further fact, established by Mr. F. W. Very and the writer, that two distinct heat maxima are observable in the lunar spectrum, one corresponding to the radiation reflected from the soil, the other to that emitted by it. It at first seemed, in accordance with what has just been said, that the accurate determination of the wave length of this latter maximum would give a correspondingly accurate determination of the temperature of the sunlit surface of the moon; and, accordingly, to this object the main portion of the observations were given. We may anticipate what follows by here saying that by this method, a perfectly correct one in theory, the writer believes that the temperature of the lunar soil could be determined with great exactness, were it not for the intervention of the earth's atmosphere, which exercises, in this part of the spectrum as in every other, a highly selective absorption, indicated here, however, not by fine lines like the Fraunhofer lines of the solar spectrum, but by enormously wide "cold bands," which vary in size and even in position from night to night,* rendering the exact position of this maximum in a corresponding degree indeterminate.

Another chapter is occupied by an example of a single night's work in detail, with a statement of some of the precautions and corrections employed in practice. It may be observed here in general as to the apparatus, that while the rock-salt train, as already mentioned, is of such perfection as to show the Fraunhofer lines very completely in the lunar luminous spectrum, the accompanying bolometer and galvanometer enable us to measure cold bans in the non-luminous lunar or air spectrum, whose heat is otherwise inappreciably so small that it corresponds to a radiation of $\frac{1}{1000000}$ of a small caloric per second, measured by the generation of a current of 0.000,000,001 ampere. This is the amount of heat and current implied in moving the galvanometer image over 1 mm. of the scale. The image is quite steady enough under favorable conditions in fact to admit of the observation of less heat than this, giving deflections of fractional portions of a millimeter; but owing to fluctuations in the absorption of our atmosphere which transmits this radiation, rather than to any limitations of the instrument itself, it is generally found best not to note deflections of less than 1 mm. What has just been said refers particularly to measures of the diffused heat from the moon's soil in the invisible lunar spectrum and of the corresponding spectral analysis of the reflected heat. When, however, we place the bolometer directly in the lunar image formed by the 8-inch aperture, the deflection throws the needle at once off the scale, and is found on more careful measurement to correspond under favorable circumstances to a potential deflection of about 1,500 mm. divisions. Melloni, it will be remembered, obtained four or five divisions on his galvanometer with the thermopile and the meter polyzonal lens on Vesuvius, and the immense difference just noted is some indication of the advance of experimental physics in this matter since his day.

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Comparison of the intrinsic intensity of solar radiation with that of the electric arc in different parts of the spectrum. This observation of the comparative intensity of the sun and the electric light is given in the original memoir only so far as to show that it brings independent evidence of a large atmospheric absorption of the extreme infra-red rays and enables us to estimate approximately the amount of this absorption at each point in the spectrum. The observations were not repeated to obtain such a thorough comparison as would be desirable. As they have never been printed, however, and since, as far as we know, none other such exist, we will give them here under the caution that they are to be considered only first approximations. The light was that from the pit of the positive carbon of gas coke, one inch in diameter, with the current derived from a dynamo, actuated by an engine of 10 horse-power, and therefore certainly at least as intrinsically hot and bright as any smaller arc light in more common use, and presumably much more so. The apparatus was that already described in the memoir, "On Hitherto Unrecognized Wave Lengths."

The following table gives the observed galvanometer deflections after applying a multiplying factor for the shunt, which had to be used for the larger readings:

1		2	3	4	5	6	7
Deviation Rock Salt 60° Prism.		Wave Length.	Observed deflection *sun* after absorption.	Observed deflection *arc*.	Calculated deflection *sun* without absorption.	Observed ratio sun and arc.	Calculated ratio of unabsorbed sun and arc.
°	′	μ	div.	div.	div.		
43	53	0.373	7.5	1.3	84.	5.77	26.0
43	17	0.398	11.5	1.5	38.	7.67	21.8
41	54	0.489	33.5	5.3	60.	6.32	14.4
41	05	0.587	104 0	10.5	115.	9.90	11.1
40	45	0.663	204.0	22.0	204.	9.27	10.0
40	27	0.749	432.0	48.5	450.	9.38	9.1
40	05	0.96	1 078.0	215.0	1 763.	4.99	8.2
39	54	1.13	1 786.0	459.0	3 584.	3.88	7.7
39	20	2.87	1 905.0	882.0	5 645.	2.16	6.4
39	00	4.3	521.0	245.0	1 368.	2.22	5.8
38	45	5.6	75.0	157.0	882.	0.48	5.8
38	00	10.4	19.5	39.0	156.	0.50	4.0

The result of the comparison of the (of course unabsorbed) electric arc with the radiation of the sun after absorption, as shown in the sixth column, is that this solar radiation in the orange and red is nearly 10 times that of the arc, while towards the violet end of the spectrum, the relative superiority of the absorbed solar heat diminishes, evidently because of the progressive increase of the atmospheric absorption in that direction, which lessens the solar intensity without sensibly affecting that of the arc. The solar efficiency continues greater through all the infra-red spectrum known until very lately, while in the extreme portions recently investigated, it falls below that of the arc. This is partly due to the fact that radiation from a source at a lower temperature (the arc in this case) is relatively more powerful in the longer than in the shorter waves; yet it can hardly be doubted that here also (that is, in the *extreme* infra-red) a very large atmospheric absorption has taken place.

There is reason to believe that a considerable part of this absorption takes place in the first few meters of air, while we conclude, from all the evidence in our possession, that the real telluric absorption, being a locally selective one, is much greater than the comparison of high and low altitude observations alone would indicate.

The import of this comparison will be still more evident from a consideration of the seventh column, where by means of the Allegheny tables of the solar absorption, we have calculated the ratio of the arc heat to that of the sun before absorption by the earth's atmosphere. Although a large absorption by the solar atmosphere has already taken place, we see that in the ultra-violet the solar radiation is from 20 to 30 times that of the arc, while that of the absorbed sun is only about six or seven times. When we reach the region of the red and upper infra-red, we see that these ratios are nearly the same in the absorbed and unabsorbed solar radiation, showing that the terrestrial absorption in this region (which was once supposed to be its principal seat), is in fact very small, while in the regions of the extreme infra-red corresponding to temperatures not greatly exceeding that of the terrestrial soil (regions only revealed by quite recent investigation), the telluric absorption again becomes considerable.

The general result of this comparison is to enhance our ideas as to the rate of solar radiation, and as to the solar temperature. Comparisons of the total solar radiation with the total arc radiation, have (it may be observed), been made before, but so far as I am aware, comparisons of the heat in different portions of their spectra are here presented for the first time.

Of the numerous conclusions to be drawn from this research, we here only direct the reader's attention to what we consider the most important one, namely: That the mean temperature of the sunlit lunar soil is much lower than has been supposed, and is most probably not greatly above zero Centigrade.

I would ask to be allowed here to state that the very considerable expense for the special means and reduction of the preceding series of lunar researches was borne by one of the most generous and disinterested friends that science has had in this country, the late William Thaw, of Pittsburgh. By his own wish, no mention of his name was made in previous publications in connection with the results so greatly indebted to his aid. His recent death seems to remove the restriction imposed by such a rare disinterestedness.

*That an absorption band may vary in magnitude will excite no surprise, but that it should vary sensibly in position may appear to some in contradiction with our knowledge of the fixity of lines in the upper spectrum. An explation of the anomaly will be found in the *American Journal of Science* for Dec., 1888.

Mr. Carty's Paper on "Telephone Induction."

We publish in this number a very interesting paper by Mr. Carty, of New York, on "Telephone Induction." We think that for the first time attention has been called to the fact, mentioned by Mr. Preece in the year 1875, in the case of telegraph lines, that in a telephone circuit exposed to induction effects of neighboring telephone wires, a neutral point exists, where cross-talk is not found.

The fact that cross-talk is caused by electro-static rather than by electro-magnetic induction, and which Mr. Carty illustrates by several experiments, was already found some years ago by Mr. Patterson, and has been put to practical use in the construction of the Patterson cables.

The author of the article remarks that the induction is less when air is used as an insulator, than with any other substance among the materials adopted in practice; in the Patterson cables the insulating material in a melted condition is impregnated with air. In conclusion Mr. Carty suggests that Prof. Hertz's latest discoveries might lead to a solution of the inductive difficulty in so far as they show that it is quite possible to refract, reflect, and cause to disappear, by interference, these waves of electro-magnetic or electro-static induction.

That the paper is a valuable contribution to the question of inductive disturbances will be acknowledged at all hands.—*The Telephone, London*

Electricity in House Lighting.

The encroachment of electricity upon gas in house lighting is increasing. More and more private residences are being wired for and lighted by electricity every day, and this is the case more especially in small and growing towns than it is in large cities. Little towns like Marshall, Tex., Vicksburg, Miss., and the small towns of the far west are falling into line and availing themselves of every fresh improvement that will increase the returns from investment and enhance the worth and reliability of the light itself. In the New England States this condition of things to day obtains to a noticeable extent. Science, commenting on the foregoing, very truly says: The question now is how to distribute the electricity with a fair profit on the investment. Among the methods making rapid strides is that of the distribution of electricity by means of the alternating current. The very type of machine which the authorities consider so dangerous to life will no doubt be that which will eventually solve the problem of universal electric house lighting. The current in the outside mains is of a high pressure—1,000 volts or more, as the case may be. This current is transformed by means of the converter to a lower potential and carried into houses at the safe and low pressure of only 50 or 100 volts.—*Toledo Commercial.*

A Wild Claim—Across the Atlantic in 26 Hours.

[*From The Pall Mall Gazette*].

Leonide Apostoloff, a young Cossack engineer, whose name is hardly known outside his own country, claims to have made a discovery and patented an invention destined to change the face of the maritime world. Wild as his claim may sound, for he asserts that his invention will enable us to cross the Atlantic in 26 hours, there is enough substance in his dream to have secured him three years leave of absence by the Russian Government in order that he may prosecute his scientific researches. M. Apostoloff elected to study at Marseilles. There a representative of *The Pall Mall Gazette* called upon him. M. Apostoloff is tall and dark, his face bespeaks energy and great determination. He is eight-and-twenty.

"Is it true," asked our representative, "that you expect to perform the voyage from here to Algiers in four hours?" "Certainly," replied M. Apostoloff. "My boat will travel 100 knots an hour, that is to say, five times quicker than the fastest steamer. I have applied to navigation the spiral principle, that is all."

"But what is the spiral principle?" "It is somewhat difficult to put into words. You know that it takes longer to hammer a nail into the wall than to screw it in. Again, in old days, the ball from a gun went thus —— straight at its object and hit perhaps at a hundred yards. Now the ball is twisted out and goes immensely quicker and much further. Still another illustration. Why does a man swim? Because he agitates his arms and legs you reply. Very good. But why does a serpent swim?" and M. Apostoloff smiled triumphantly. "You do not know? Perhaps you did not even know that he who tempted our first mother swam at all. Yet a serpent once in the water goes quicker along than the fastest fish."

"What suggested this idea to you?" "When I was quite a young fellow my regiment was ordered to Samara, where a bridge was being built over the river. The district is singularly bereft of stones, and as they were absolutely necessary in making the foundations of the bridge, the moujiks extracted them from the bed of the current itself. And how? By means of an ingenious invention of their own. A rope was coiled several times around a large tree trunk. One end of the rope had been made fast; to the other dangled an iron claw named koschka, which signifies little cat's claw. At a touch from the hand the beam turned around in the water, the rope, unwinding itself with the rapidity of lightning, descended and the claw clutched hold of anything it found in the bed of the river, and at a reverse touch the beam brought it up to the surface. Sometimes very large stones were brought up in this manner. This struck me greatly. How intelligent of these poor peasants to have discovered the spiral principle for themselves! Simply dropping the rope into the water would not have been of any good! If you doubt this try it for yourself with a pencil and bit of thread."

"Then I suppose you began trying experiments?" "Just so. I tried many experiments, wishing also to discover some new motor to drive my boat along. But the great principle of the thing lay in the spiral idea."

"But how can you apply the pencil and thread plan to a boat?" "Thus. My boat to look at it is not unlike a long, rather pointed, egg in shape, an egg round which has been twisted a piece of string. It will revolve rapidly; in fact, the difference between the speed of my boat and the modern steamer will be—to quote myself again—the difference between a blunt nail driven into the wall and a nail screwed in. You are wondering where the passengers will go. Well, inside, for this egg-shaped form is only an outside shell. Inside, fastened securely to the beam running through it, is an inner shell, cabin, etc., which remains absolutely steady as if on land. You will note that the rudder is both perpendicular and horizontal. This enables the steerer to direct the boat up or down under the water, a thing the usual torpedo boat cannot do. This is, roughly speaking, a torpedo boat—half in and half out of the water. My Bateau Plongeur will remain habitually under water."

"Of what material will your Plongeur be made?" "Of the strongest steel, to enable it to resist the great pressure of the water above it. On the other hand, the boat will be very light, so light indeed that in case of any injury to the machinery, etc., there will be no danger, for it will of itself rise to the surface of the water."

"How will the inhabitants of your little craft breathe?" "Every thirty-eight hours it must come up for a long, deep breath," answered M. Apostoloff smiling. "Practically the only danger we have to fear is the outer shell, or corps tournant, getting smashed either by running on to a rock or encountering a whale. Still a powerful electric light will shine through the belt of thick glass running around the boat, and will illuminate

the water depths above, below, and for a hundred yards all round us."

"And will the Plonguer always remain under water?" "No, not necessarily so; but if it is half out of the water the speed of the corps tourant will be reduced by nearly half, the boat will proceed at a rate of eighty knots an hour, instead of scuttling along at 120 knots an hour."

"Your invention will be chiefly useful for the purposes of maritime warfare." "I wish more to utilize my discovery for the purposes of commerce, but of course, as a torpedo-boat, it will be irresistible."

"Have you ever actually tried it yourself in water?" "Yes. Some time ago in Russia, on the Volga. I was not rich, so I built my boat of tin, rather a fool-hardy proceeding. A steamer containing a party of my friends started to race me. In a few minutes I had rushed far beyond it, and in fact disappeared entirely from their sight. 'Alas!' cried they, 'Poor Apostoloff has gone to the bottom.' But after some time they came up to me. I was resting comfortably on the bank. Great, as you may suppose, was their joy and relief. But the extreme rapidity with which my boat had gone caused the tin, of which it was composed, to smash up."

"And when will you have your craft in working order?" "By January. It will be 28 metres long and about 3½ metres through in the thickest part. There will be room for 25 persons. My first voyage will be to Toulon and back in 50 minutes; my next trip will be an attempt to go to Algiers and back in 8 hours. I now have over 50 applications from people anxious to go on the trial trip."

"Now, M. Apostoloff, we come to what is of course an important item. Where does your motive force come from?" "Ah, that is my secret. I have discovered a new electric motor which cannot, unluckily, be patented; that is why I am keeping it to myself as long as I can. Soon it will become common property, but no one can steal from me my corps tournant," he added cheerfully, "and without that they can never hope to attain one-third of my speed."

"And what will be the relative cost of your Bateau Plongeur in comparison to the ordinary torpedo boat?" "Forty per cent. cheaper, as far as the cost of construction is concerned, and 94 per cent. cheaper in actual working expense. Thus the 100f. worth of coal which goes to supply the torpedo boat will be replaced by 6f. worth of my new 'motive force!' In fact, there will be practically no working expenses after the first installation."

"You can at least tell me one thing about your new motive power. Will it also supply the light?" "Yes, it will."

"Have you ever thought of seriously adapting your Bateau Plongeur to passenger traffic?" "Certainly. Think what it will be for a man of business to get to New York in 26 hours. Those who do not like the idea of being inside the shell will have to have a kind of platform attached to the extremities of two of my Bateaux Plongeurs."

"And do you propose to sell the patent to any country?" "Certainly not; or, rather, if I did I should of course keep it for Russia, my own country."

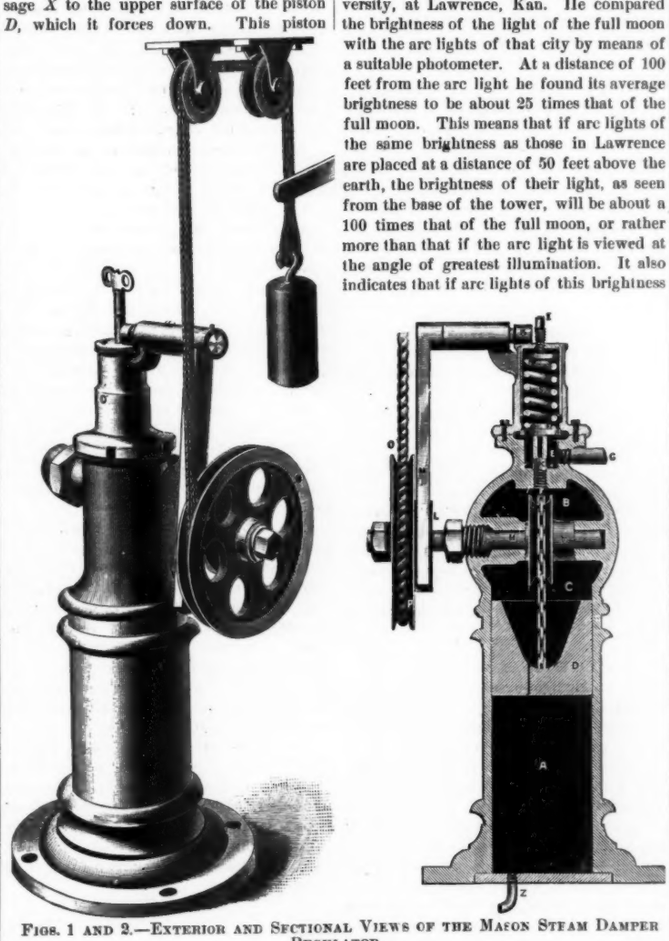
Economic Value of Electricity.

Mr. A. R. Foote's book on the "Economic Value of Electric Light and Power" is of more than ordinary interest to the public at the present time, when there is so much doubt expressed in various quarters as to the danger invested in the wires which contain the electricity used for lighting our cities and for a motive power. The subject is treated, as the title indicates, from an economic point of view, and it is well worth careful study. The book is full of statistics and arguments favoring the general adoption of electricity for lighting and as a motive power; and the statements are very clear, comprehensive, and conclusive. The author says: "To speak of the dangers of the electric service is a misnomer," and he gives extracts from the reports of the fire departments in several large cities, showing that a large percentage of the fires is caused directly by oil. Selections from papers written by insurance experts are quoted, proving that electricity, when properly handled, is the force most easily controlled and least hazardous, and that electric lighting is the best and safest form of artificial illumination. The testimony of eminent physicians, showing the hygienic advantages of electric light in our public theatres and halls, is also given. Much of the mystery connected with electricity to the average person is caused by ignorance, or a very slight knowledge of what is in reality the greatest force which man has ever made his servant. Mr. Foote treats the subject in an intensely practical manner, and uses language which is intelligible to the general reader. He defends in a most able way a subject which has been so misrepresented by ignorant or unscrupulous writers, and throws much light upon a force which is but little understood by the masses as yet.

The Mason Steam Damper Regulator.

The accompanying cuts represent the exterior and sectional views of a novel steam damper regulator, recently placed on the market by the Mason Regulator Company, of Boston.

From the outside view it will be readily seen that it is only necessary to set the regulator in some convenient position, and attach by a chain to the damper, while a connection is made with the boiler by means of a small pipe. The pressure desired to be carried can readily be changed by turning the key shown at the top. The practical working of the regulator is as follows, referring to the letters shown on the sectional view: The boiler pressure, which is connected at the pipe *C*, comes into the chamber *E*, the top of which is formed by a diaphragm, on which rests the main spring *S*. If the boiler pressure rises above the required point, or sufficiently to overcome the tension of the spring *S*, the diaphragm is raised very slightly and the steam passes down the passage *X* to the upper surface of the piston *D*, which it forces down. This piston



FIGS. 1 AND 2.—EXTERIOR AND SECTIONAL VIEWS OF THE MASON STEAM DAMPER REGULATOR.

being connected with the wheel on the shaft *H*, by a chain or rack and pinion, turns it around, communicating a like motion to the outside wheel, and thence to the damper in the flue. When the boiler pressure falls, the diaphragm comes on to its seat, which covers the passage *X*, and steam pressure is removed from the top of the piston *D*, while the weight on the damper brings the wheel *P* back to its original position. It is the general opinion among engineers that a regulation which suddenly opens or closes a damper to its full capacity wastes coal, which is undoubtedly true; therefore, a device which is known as a compensating lever is provided in the lever *M*, which rests on the cane *L*. As the shaft *H* turns, the lever is thrown over and works a cane *K*, which changes the tension on the main spring, immediately the regulator commences to act. By this means it is found that the damper is kept more constant and the draft steady. The regulator can be furnished either with or without the compensating lever, as desired. It is entirely made of the best steam metal.

Bury the Sun!

Statistics show that eighty persons were killed by cars in New York last year. Put the rails under ground. Sunstroke sent four individuals to a premature grave. Put the sun under ground at once and stop this fooling. Great country this—for sham reforms. —JOE HOWARD *in the Press.*

Voting by Electricity.

Mr. A. G. Safford, whose electro-magnetic voting apparatus is to be placed in the Colorado State Capitol, has applied to Congress for a ten years' extension of his patent (No. 173,673 dated February 15th, 1876), and a bill making such extension has been introduced by Mr. Stewart, of Vermont, and referred to the committee on patents. No voting apparatus according to Mr. Safford's plan has ever been constructed.

Electricity and the Full Moon.

A rather novel comparison was recently made by Prof. J. L. Black, of Kansas University, at Lawrence, Kan. He compared the brightness of the light of the full moon with the arc lights of that city by means of a suitable photometer. At a distance of 100 feet from the arc light he found its average brightness to be about 25 times that of the full moon. This means that if arc lights of the same brightness as those in Lawrence are placed at a distance of 50 feet above the earth, the brightness of their light, as seen from the base of the tower, will be about a 100 times that of the full moon, or rather more than that if the arc light is viewed at the angle of greatest illumination. It also indicates that if arc lights of this brightness are placed 1,000 feet apart at the point midway between them, the brightness of the electric light will be equal to that of the full moon.

NEW CORPORATIONS

Plattsburgh, N. Y.—The Plattsburgh Light, Heat and Power Company is formed by A. L. Inman, John H. Myers, Geo. M. Cole and S. A Kellogg, of Plattsburgh, and H. M. Pierson, of Brooklyn, for manufacturing and supplying gas for lighting the streets and buildings in Plattsburgh, and furnishing the same for power and fuel purposes; also for generating electricity and supplying the same in the village of Plattsburgh, and using the same for running motors, street cars, etc.; capital, $100,000.

Seattle, Wash.—The West Street and North End Electric Railway Company, Seattle. The objects of the corporation are to build electric railways in Seattle, and to establish electric power plants and furnish power. The capital stock of the company is $1,000,000, divided into 10,000 shares of $100 each. The trustees are W. R. Ballard L. C. Gilman, L. R. Dawson, Abram Barker and W. R. Thornell.

Scranton, Pa.—The Towanda Electric Light Company is incorporated with a capital stock of $20,000.

Springfield, Mass.—The Kewanee Electric Light Company has received license of incorporation. Capital stock, $3,000.

Nashville, Tenn.—The Signal Dispatch Telegraph Company, of New York, with a capital of $500,000, has obtained a charter under the laws of Tennessee.

Chicago, Ill.—Wire Metallic and Electric Fence Company, of Chicago; to manufacture fence materials; capital stock, $500,000; incorporators, W. D. Rinehart, F. W. Haas, B. A. Scott.

East St. Louis, Mo.—The New Brighton Electric Light Company is organized with Paul W. Abt, president; Thos. L. Fekete, secretary and treasurer, and Martin Benzen, vice-president. Capital, $20,000.

Westchester, N. Y.—The Westchester Electric Company, of the town of Westchester, is formed for generating and distributing electricity for all purposes to which electricity is applied; capital, $50,000.

Liberty, Md.—The Bedford Electric Company has organized to erect an electric light plant. The Schuyler system will be used for arc lighting; incandescent not selected yet. The capital stock is $30,000.

Omaha, Neb.—The Weeping Water Electric Light Company has filed articles of incorporation. Authorized capital stock $30,000. Incorporators, J. P. Smith, Henry Ashman, A. M. Miller, J. H. Bellows and J. Chase.

Albany, N. Y.—The Antwerp Electric Light Company is incorporated. Hon. E. B. Buckley, John D. Ellis, Morgan Augsbury, W. M. Johnson and Myron H. Burt are the original incorporators. The capital stock is placed at $12,000.

Albany, N. Y.—The Lowville and Watson Telephone and Telegraph Company, limited, is formed with a capital of $2,000, for erecting and maintaining a telegraph and telephone line between several villages in Herkimer county, New York.

Braintree, Mass.—Gen. F. A. Hobart, Hon. J. T. Stevens and other well-known citizens, of Braintree, have formed the Braintree Street Railway Company, with a capital of $25,000, divided into 250 shares, at $100 each. The road will be operated by electricity.

Milwaukee, Wis.—The Midland Telegraph Company is organized at Milwaukee; capital stock, $25,000; incorporators, Chas. Polacheck, Chas. L. Clason, O. D. Crocker, H. J. Killilea and Chas. P. Huntington. The object is to construct a telegraph line between Milwaukee and Waukesha.

Gouverneur, N. Y.—The articles of incorporation of the Antwerp Electric Light Company have been forwarded to Albany to be placed on record in the Secretary of State's office. The incorporators will then be in a position to receive subscriptions to the capital stock, which will be $10,000, with the privilege of increasing to $50,000. Many have signified their desire to subscribe, and there is not much doubt about raising it.

Bowling Green, Ky.—Articles of incorporation of the Claypool and Bowling Green Telephone Company have been filed. Officers and directors were elected as follows: Steve Roemer, president; J. Whit Potter, secretary and treasurer; J. K. Mottley, assistant secretary; directors, R. E. Porter, I. T. Lee, J. W. Morehead, L. C. J. Mottley, Ewing Hardcastle, J. K. Mottley and Chas. F. Cox. Geo. R. Gorin was selected as attorney for the company.

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The St. Louis Gas Light Company has been purchased by the Laclede Gas Company for the consideration of $4,000,000. Whew!

The preliminary schedule relating to the electrical industry is now being sent by the census superintendent to all known addresses. These schedules ask for important information concerning the companies and firms engaged in electrical work. Prompt and accurate answers should be furnished to the department, and every person engaged in this field should assist in making the report in relation to the electrical industry complete and valuable.

The International Electrical Exhibition which was to have been held this year at Frankfort-on-the-Main, has been postponed to 1891.

Four years of the Electrical Control Commission in New York, and the result is darkness. We have neither aerial or underground service of value or reliability. What a record for this Board of incompetents!

The anonymous correspondent writing about the Subway Board of New York, makes a very good point, but his communication goes where all productions of the anonymous writer should go—into the waste basket.

One of our German exchanges, states that Dr. Siemens suggested the postponement of the Frankfort International Electrical Exhibition until next year, giving as his reason that Germany is far behind the United States in the way of electrical invention and progress. We do not think our German friends will be able to overtake us by '91, but we wish them every success.

The Pennsylvania Railroad Company has requested the Government to establish the latitude and longitude of Altoona, apparently for the purpose of securing a standard which will enable it to organize and conduct its own time signal service, independently of the Naval Observatory or any other scientific institution. Professor Mendenhall will have the work done with the exactness with which the Coast and Geodetic Survey always accomplishes such operations.

Mr. Foote, the electrical agent of the census, is in a quandary similar to that of the Irishman whose pig would not stand still long enough to be counted. The various electrical industries are developing so rapidly, and presenting so many new phases, that it is difficult to formulate a clear and simple plan for gathering and arranging the proper statistics. Mr. Foote has received many useful suggestions from manufacturers and others, and has just started on a three weeks' trip through the eastern States to consult with men in the business, with a view of obtaining still further information on the subject before setting his men at work.

THE TRUE POSITION.

All electric lighting men should meet the danger question squarely. This remark is suggested by the emphatic declaration recently made by an electric lighting expert "that all this excited discussion in the newspapers about the danger of the electric current is nothing but a *fad.*" He must be an eminent expert because he is a graduate of one of the leading universities, has held high official positions, is a man of much experience in financial affairs, and he has been in the electric lighting business for *three weeks.* Men have been killed by contact with public lighting wires; still more men are liable to be killed by the same means at any moment. It is no excuse for this danger to refer to the number of deaths from other avoidable causes. Electric lighting by high tension currents has become an absolute necessity, and its use will inevitably extend beyond all present conception. At the present moment nothing is doing more to delay its extension and embarrass its use than the spirit manifested by the opinion quoted above. And nothing would do more to clear away misapprehension and prejudice from the public mind than a fair, candid admission of the simple facts and an united and determined effort to speedily secure a thoroughly efficient lighting system *minus* every element of danger which can possibly be removed. The key-note of the crusade which will accomplish this result is perfect construction. And this needs many more skilled workmen. It would be a blessing if the self-assumed title of "expert" were abolished. Fairer treatment and better facilities for running wires must be had from municipal authorities and will be more readily obtained when safer construction is assured.

A LITTLE ELECTRIC LIGHTING HISTORY.

The destruction by fire of the Pearl street station, New York, of the Edison Illuminating Company, removes an historic structure. This station was not, however, the first one in the world to supply the incandescent electric light to consumers, although first planned and work on it first commenced.

January 12th, 1882, the London Edison station commenced operations at 57 Holburn Viaduct, under the direction of Mr. E. H. Johnson, afterwards president of the Edison Electric Light Company, and Mr. W. J. Hammer. The fusible plug which was used in closing the first circuit is still in the possession of Mr. Hammer, properly labeled. Two Edison "Jumbo" dynamos had been installed, and the station started up with 3,000 sixteen candle-power incandescent lamps. Two more dynamos were soon afterwards added, and the plant at the start was complete with the underground system, Edison meters, etc., and was described at length in the London daily papers and technical journals of that date. American capital and enterprise started the plant, which had been located on property owned by the Crown, and was done at the suggestion of Mr. Edison to demonstrate the efficiency of his system.

The Pearl street station was commenced the latter part of 1881, and was completed and commenced operations September 4, 3 P. M., 1882, and had been in constant service ever since until burned down last week. The work of installing the plant was done under the direct supervision of Mr. Edison, his assistants being Francis R. Upton, Chas. L. Clark, John Kruesi and others. The planning and building and successful operation of this station Mr. Edison considers his greatest achievement, and so expressed himself to the editor of the REVIEW in reply to a direct question put to him two years ago. There were no guide-posts to point the way, no past experiments to teach, the entire station when completed appearing as the material substance of what had been planned and thought out by Mr. Edison.

The night the station was started was a memorable one and will never be forgotten by all who were present, the chief inventor participating in the work with a confidence that impressed all. The record of the station is well known to electrical history, and while, no doubt, many mistakes had to be rectified and numerous changes made, yet the Pearl street station presented one continuous period of operation from the day it started until the day of the fire.

At the time this work was being done in New York, and Messrs. Johnson and Hammer were in London, Mr. Chas. Batchelor was representing Mr. Edison in the same line in Paris, and thus the three great cities of the civilized world were made acquainted with this advance in electric lighting at the same period.

THEY WANT THE ELECTRIC LIGHT.

The citizens of New York City are asking that the electric light be returned to them. The following from an editorial in the *Mail and Express* of January 4th, gives an excellent idea of the feeling in regard to the situation as it at present exists:

"It will not do to go ahead blindly, tearing down all the poles and wires in the city, without providing some adequate substitute. The complaints of private citizens and of business houses are already loud and frequent. Every newspaper in the city, it is safe to say, receives dozens of such complaints every day from persons whose health or whose business is suffering from the present state of affairs. The present situation cannot be allowed to continue. Something must be done to alleviate it. Surely, in the apparent absence of any other possible plan, it would be better to adopt a temporary system of overhead wires, under proper regulations, than to go on in the present fashion."

The lecture of Prof. Cross, at the Electric Club Thursday of next week, will repay many fold every member who attends.

ELECTRICAL NEWS.

What is Transpiring in Electrical Circles in the Leading Cities.

OUR BOSTON LETTER.

Cape Cod.—Yarmouth is watching Hyannis' success in electric lighting before taking the plunge herself.

Manchester, N. H.—The annual meeting of the Northern Telegraph Company was held last week. Ex-Governor Frederick Smyth, Col. John B. Clarke and William F. Head were chosen directors, and Charles H. Bartlett, clerk. An annual dividend of four per cent. was declared. The line is leased to the Western Union.

Mr. John S. Sullivan, one of the operators of the Western Union, died at his mother's home, Mt. Bowdoin, on December 30th. He was 23 years of age, and had been an operator for eight years. He was esteemed by all who knew him.

West End Company.—A very comprehensive time-table of the electric lines running in the southern parts of the city has been issued by the West End Company. The service is improving daily, and is appreciated by the thousands of the road's daily patrons. General Manager Monks and Master Mechanic Louis Pfingst are in New York looking up appliances for electric cars. The West End Company has applied for a charter for an elevated road. The influenza still continues its ravages among the employés of the road. Nearly 200 new cases have been reported in the last few days.

City Lighting.—The superintendent of lamps has received new proposals for lighting in place of those rejected on November 29th. They are as follows: Suburban Light and Power Company, for Roxbury, for one and three years, 38.99 cents a light per night; for five years, 39.74 cents a light per night; for the city proper, South Boston, West Roxbury and Dorchester for five years, 39.74 cents a light per night. Brookline Gas Company, Brighton district, for five years, 40 cents a light per night. Walworth Light and Power Company, for the entire city, for five years, 40 cents a light per night.

The award of the contract was taken under advisement. These bids show a reduction of 25 cents a light per night for a one year contract in the city proper, taking the bids of November 29th, as a comparison; 15 cents a light for three years, and 10 cents a light for five years.

The Charlestown Gas Company and the Boston Electric Light Company, sent letters to the Mayor stating their positions. The former company is ready to supply electric street lighting, but the terms and conditions of the proposal precluded the company from making a bid. The Boston Company states that while desirous of continuing its business relations with the city, it cannot do so under the advertisement for proposals.

The Board of Police for the city of Boston has sent to the governor its annual report. Among other interesting items are the following: The work of equipping the city with the municipal police signal system was completed in November. The total number of boxes is 411; miles of wire, 213.5; average cost per mile, $99.10.

President Henry M. Whitney, of the West End Company, was one of the prominent men requested by the Boston *Globe* to send a New Year's message to the people of the city. Mr. Whitney said:

The railway company have, within the last day or two, purchased the property in Cambridge of the New England Glass Company, where they intend to place their power plant for the operation of electric cars in Cambridge, Charlestown and Somerville. The property is well adapted for immediate use, as there is a large chimney sufficient for 6,000 or 7,000 horse-power, buildings suitable for engines and boilers, and a wharf for landing coal. The company have already contracted for about 2,000 horse-power in engines to be placed in this power house, which will be sufficient for immediate needs, and hope to have the plant in operation early in the summer.

The directors have recently authorized the purchase of 200 open cars, thereby adding nearly 25 per cent. to our open car equipment, and are expecting to contract for a large number of additional box cars, to be ready for another winter.

The growth of the passenger business is so rapid that it is difficult for the company to provide equipment rapidly enough to meet the demand. The number of passengers carried per day has averaged for each day in December nearly 50,000 a day more than in 1887.

So far as I am able to judge from expressions of opinion by all communities that are now reached by the electric cars, the electric system is giving most excellent satisfaction, and we are solicited to extend the system from all quarters.

The Sick List.—Mr. Edward Blake, of the New England Electric Company, who has been detained at home by a complication of diseases brought on chiefly by overwork, is convalescent and will leave for the South as soon as he is able to travel.

Mr. S. C. Peck, of the Thomson-Houston Company, has been very ill with typhoid fever for the past two weeks. He is slightly better at this writing, but is still unable to see any of his friends, who are very solicitous for his speedy return to health.

Col. L. W. Burnham, of the Electric Gas Lighting Company, is laid up for a few days on account of illness. His malady is not of a serious nature, and in a short time we expect to see the genial Colonel about again and as good as new.

Mr. O. K. Stuart, of the Thomson Electric Welding Company and the Wright Electrical Engineering Company, is at his home in Philadelphia suffering with the fashionable disease, "La Grippe."

The Electric Gas Lighting Company, formerly at 35 Arch street, have removed to newer and more commodious quarters at 195 Devonshire street. The store and basement, running through from Devonshire street to 56 Arch street, nearly opposite the old place, comprise about 3,500 square feet of floor space. The change was necessitated by the rapid increase in business, and Col. Burnham was compelled to seek better facilities for the prompt accommodation of his customers. The new quarters are as completely and handsomely equipped as any in the city, and with the usual high standard domestic electrical appliances and electrical goods kept in stock by this company, a prosperous New Year is sure to be their portion.

Annual Banquet.—On Wednesday evening, January 1st, the Wright Electrical Engineering Company, of this city, held its first annual banquet at the American House. The occasion of the event was to celebrate the successful growth of the company during the first year of its existence.

The *menu* was very tasty and elaborate, and full justice was done to it by the 30 or more employés and invited guests. After coffee and cigars had been served, Mr. Frank Ridlon, the president of the company, called upon Col. Ransom to read telegrams of congratulation and regret from several guests who were unable to be present. Mr. Ridlon then gave an address of welcome, and said that the success of the company was chiefly due to the untiring energy of Mr. Alex. P. Wright, the managing director, and to the harmony and good feeling which prevailed in all departments of the company.

Mr. Wright was then called upon and said that he was a man of action rather than of words, and so a speech could not be expected of him. Nevertheless, he told the history of the company in a very interesting manner. A year ago he was office boy, engineer, accountant, manager, typewriter and foreman, but now, after a most prosperous year, he saw an office and working force of 25 persons, and from 50 to 125 men every week on the pay roll.

The other speakers were John Post, Jr., one of the directors; F. E. Pettingell, Charles H. Herrick, secretary of the company; W. E. Stow, superintendent of construction; Sam Horton, Walter Pettingell, Theo. Gould, Jr., Dr. Austin, A. C. Shaw, S. L. Coles, of the ELECTRICAL REVIEW; Col. C. M. Ransom, L. S. D. Dumoulin and T. McCoubray, of Baltimore.

Mr. Ridlon spoke for Mr. O. K. Stuart, the new treasurer of the company, who was kept at his home in Philadelphia by illness. Col. Ransom read a poem entitled "The Settling Up."

A toast was drunk, standing, to the health of the ladies connected with the company, and then the guests departed with hearty wishes for another year of prosperity for their hosts.

Gov. Brackett's inaugural address contains the following relative to the dangers from fire and electricity:

"The recent disastrous conflagrations in Lynn and Boston, forcibly suggest the importance of your considering whether, by the revision of the building laws and measures for their better enforcement, or by other pertinent legislation, more effective safeguards cannot be provided, which will diminish the danger of such disasters in the future. The report that the Boston fire was caused by an electric wire, and the accidents almost daily occurring from the same cause, admonish us that, while electricity has been made so largely subservient to the uses and convenience of civilization, it is adding to the insecurity of life and property. The necessity is urgent for the enactment of laws for the supervision and regulation of electric wires wherever they exist, and for such other carefully matured measures as will, without impairing the use of electricity, lessen the perils attendant thereon.

Boston, Jan. 6, 1890. S. L. C.

OUR WASHINGTON LETTER.

Six Thousand Three Hundred Dollars is the sum named in a bill before Congress for furnishing and laying 2½ miles of submarine telegraphic cable to connect Cape Flattery with Tatoosh Island at the entrance to Puget Sound.

Fixture Bids.—The following table gives the bids for combination fixtures for public buildings, received by the Treasury Department and opened on the 23d inst., the lowest prices being those on the last line:

	Marquette, Mich.	Lacrosse, Wis.	Owensboro Ky.	Oshkosh, Wis.	Auburn, N. Y.	St. Joseph, Mo.
Horn B. & Forsyth, Phila.	$1,182.25	$1,243.90	$678.50	$1,006.75	$981.30	$1,753.60
Schultz Art Metal Co., Baltimore	1,291.35	1,254.85	772.47	1,020.78	968.86	1,761.85
Bergmann & Co., New York	1,258.13	1,382.52	774.62	1,013.17	990.45	1,903.37
Thackara Mfg. Co., Phila.	1,394.73	1,483.39	866.17	1,228.18	1,043.11	1,822.05
Archer Fancoast Mfg. Co., N. Y.	1,177.75	1,164.50	741.15	979.40	853.50	1,678.75
Hollings & Co., Boston	1,688.75	1,885.50	962.60	1,339.85	1,389.65	2,435.50
Oxley, Giddings & Enos, N. Y.	1,439.67	1,361.74	923.67	1,238.49	1,122.64	2,111.30
E. Baggot, Chicago	1,525.50	1,444.00	895.00	1,113.50	1,067.50	1,994.00
Vosburg Mfg. Co., Brooklyn.	1,865.08	1,960.19	1,071.02	1,492.71	1,398.12	2,729.82
Central Chandelier Co., Toledo	1,020.84	1,110.59	583.32	864.71	790.57	1,464.64

More Proposed Patent Legislation.—A bill introduced in the Senate by Senator Gorman and referred to the Judiciary Committee, provides for the establishment of a court of patent appeals, to consist of a chief justice and five associates, at salaries of $8,000 each; a clerk at $6,000, and a marshal at $3,000. The court is to have appellate jurisdiction in cases from United States courts touching patents, copyrights, trademarks, and labels; from the Commissioner of Patents in all cases touching the patentability of inventions, priority of invention among several claimants for patent upon the same invention, and in all cases of re-issue and the judicial practice of the patent office, also all cases touching the registration of trade-marks or labels and the rights of conflicting claimants therefor. All pertinent cases pending before the Supreme Court are to be transferred to the new court. Cases can be appealed from the Patent Court to the Supreme Court, but no cases relating to patents can be appealed from any United States Circuit or District Court direct to the Supreme Court.

A Proposition before the House of Representatives, of general interest, reads: "That in any suit brought against the users of any article for the infringement of letters patent covering such articles, by reason of the use of the same, it shall be competent for such user to aver that he bought such article in good faith, and without any knowledge on his part that the same was patented, and upon proof of the truth of such averment no damages nor costs shall be awarded against him, and every such suit shall be commenced within two years of the date of the infringement complained of."

The Carroll Aluminum Manufacturing Company, organized in Virginia, capital $1,000,000, in shares of ten dollars, with business office at No. 391 Fifth avenue, New York, proposes to engage in purifying and preparing aluminum for use in dentistry by processes patented by Dr. C. C. Carroll, of Meadville, Pa. The metal is rolled and beaten into thin foil and used in filling teeth as a substitute for gold, and also in making plates for artificial teeth. The Aluminum Company, which controls the Herault patents, is building extensive works at Boonton, N. J., and making preparations for active operations. It is also making elaborate experiments on the production of aluminum alloys by artificial processes invented by Dr. F. P. Dewey, who has for seven years been the metallurgist of the National Museum and who recently resigned that position in order to devote his entire time to matters connected with aluminum inventions, patents and manufactures.

The following bids for installing an electric lighting plant on board the "Miantonomah" were received and opened at the Navy Department on the 31st of December:

Thomson-Houston Electric Company	$17,474 00
The E. S. Greeley & Company	21,429 00
The United Edison Manufacturing Co.	18,103 80
The Brush Electric Company	16,337 98

The "National Prototypes," consisting of a meter and a kilogram, made of platinum and iridium, were recently received by the government and taken out of their carefully sealed packages by President Harrison, in the presence of leading officials and scientific men in Washington. These standards are one of about 40 sets constructed in Paris, under the supervision of the international congress of weights and measures for distribution to the principal governments of the world. The establishment of the international bureau of weights and measures was provided for by a treaty signed at Paris in 1875, and the study of methods for practically carrying out the theoretical requirements, agreed upon as necessary by the delegates, has engaged the attention of a large staff of learned men, the benefits of whose labors is now given to the world. The "prototypes" belonging to this government are deposited in the department of the Coast and Geodetic Survey. It is probable they will, eventually, be placed in the *crypt* of the Capitol building, a gloomy place down in the foundations of the dome, originally designed as a resting place for the mortal remains of George Washington, which a vigilant and faithful public servant was paid 30 years salary for guarding, although the tomb of the illustrious father was 20 miles away. The *crypt* will answer admirably as a safe deposit for scientific instruments.

Electrical Standards.—The question of having the government undertake the work of establishing accurate electrical standards is receiving much consideration, and it is probable that a bill, giving the necessary authority and appropriating sufficient funds, will be brought before congress. Professor T. C. Mendenhall, who is one of the very best authorities on this subject, will shortly visit St. Louis, and other places in the West, to speak before several engineering societies. The Electric Club, of New York, would do itself and the public a valuable service by inducing Professor Mendenhall to deliver an address on this important subject at one of its meetings. G. C. M.

Washington, D. C., January 3, 1890.

OUR LONDON LETTER.

The Minds of the Public are at the present time principally exercised on the result of the great gas strike in the south of London, and this is certain that the great reform in light electricians are endeavoring to bring about will be much hastened by the bad repute the older system of lighting will gain through the general discomfort occasioned by the dispute. As showing what would be possible in an emergency and an example which, I have no doubt, London manufacturers of electric light plants have not merely noticed but have taken such advantage of as to prepare themselves thoroughly to meet also at Victoria station, Manchester, in which, owing to the great strike, there was a total failure of gas, was lighted as quickly as possible by electricity. Those employed consisted only of the Lancashire and Yorkshire Railway Company's telegraph and electric light staff, in all under a dozen men, and within six hours of the order being given the chief platforms were lighted, and in 36 hours the whole station was illuminated with a few arc lamps and about 250 incandescent, and this although the current had to be conveyed nearly a quarter of a mile and the necessary circuits to be run.

It is Thought the Southwark Subway Electric Railway will be opened to the public about March next, much later than the contractors Messrs. Mather and Platt originally expected; but considerable delay was occasioned through encountering in their progress the soft soil of the bed of an old river. The London terminus at the Monument is now completed and the company have already taken up their offices in the upper portion of the building.

At the last students' meeting of the Institution of Electrical Engineers a paper was read on "Electric Traction," by Mr. A. E. Childs. Mr. Gisbert Kapp was in the chair and took part in the after discussion.

At the Physical Society's last meeting the President, Professor Reinold, in the chair, Mr. Shelford Bidwell, F. R. S., communicated a paper "On the Electrification of a Steam Jet," and which was discussed by Professor Rücker, Dr. Fison, Professor S. P. Thompson and Professor Forbes.

The St. James and Pall Mall Electric Light Company, Limited, have appointed as their chief engineer Mr. Sydney T. Dobson, M. T. E. E., and late senior assistant engineer at the Vienna central station of the Imperial Continental Gas Association.

At the approaching Electrical Exhibition, at Edinburgh, Messrs. Immisch and Company, who have so successfully demonstrated the motive power of electricity in their launches on the Thames, have signified their intention of running electric launches on the canals conveying passengers to and from the exhibition, and also for other excursions. The contract for the whole of the arc lighting of the exhibition has been secured by the Brush Electrical Engineering Company, Limited, of 112 Belvidere Road, Lambeth, and will be effected by means of about 350 Brush arc lamps, each 2,000 nominal candle-power, run in series from Brush dynamo machines.

At Glasgow last Monday a lecture was delivered by Professor Jameson, of the College of Science and Art, upon "Fire Risks Connected with Electricity." The Professor gave the general precautions, adequate insulation and the provision of conductors of section sufficient for the work to be done. The rules on fire risks connected with electricity as laid down by the Institution of Electrical Engineers, the Phœnix and the Westminster Fire Insurance Companies respectively, were gone into and in the discussion which followed many electricians and insurance companies representatives took part.

An Illustrated Daily.—The proprietors of the *Graphic* which is, perhaps, our chief illustrated weekly, and whose only possible rival is the *Illustrated London News*, both being published at the same price, sixpence, are about to issue an illustrated paper, *The Daily Graphic*, at the small price of a penny. The undertaking is a great one, but there can be little doubt of the ultimate success. The first issue is to be on the 4th January next, but a preliminary specimen number has already been issued and has gained golden opinions from everybody. One of the first illustrations in the preliminary number is that of a *Graphic* telegraphic car with their war correspondent seated therein sketching, and the proprietors speak of a day not yet arrived when their special artist at the seat of war can make a sketch to be reproduced *fac simile* by telegraph in the London office in the twinkling of an eye, and that they may be within memorable distance of such a feat of electricity.

Apropos of the Antagonism between gas and electricity, I take the following interesting notes from our esteemed contemporary, *Industries*: That gas and electricity can get on very well together has lately been demonstrated in several towns on the Continent, but probably nowhere in a more striking manner than at Stockholm. At that town the gas company have applied for funds for the erection of a large electric central station, and at the same time for the building of a new gas works. The money required is about £80,000 for the former and £275,000 for the latter undertaking. Evidently, the directors of the Stockholm Gas Works do not think that the use of gas is on the wane, or that it will be reduced by the electric light. In Stockholm the consumption of gas rose considerably last year, although there were 14,000 incandescent lamps and 250 arc lamps in use. In Gothenburg, in spite of a number of new electric installations, the consumption of gas rose from 2.5 millions cubic metres in 1887 to 2.7 millions during 1888, an increase of eight per cent. In Berlin, where the central stations feed some 100,000 lamps, in addition to the large number of private installations, the consumption of gas has risen, on an average, some five per cent. per annum. Last year the private consumption of gas rose even to 7.5 per cent., although the number of electric lamps was doubled during the same period. In Hamburg an electric central station was erected last year (for 10,000 to 20,000 lamps), and this year the town, which also owns the electric light station, extended its gas works at a cost of £150,000. A similar state of affairs exists at Darmstadt.

CHARLES FFRENCH.

London, Dec. 20.

OUR CHICAGO LETTER.

The Chicago Arc Light and Power Company declared a quarterly dividend of 1½ per cent. at their last meeting.

The Edison Electric Light Company are wiring the salesroom and offices of the Electrical Supply Company, for 100 incandescent lights; the lights will be arranged in cluster, stand lights and displays.

Foree Bain reports an increasing demand for his electrical mining machinery, and is pushing the work as rapidly as possible.

The Southern Electrical Supply, of St. Louis, lately closed a lease for a term of years, for a five story building on Locust street. The building has a frontage of 40 feet and a depth of 200 feet; this looks like business.

The Mather Electric Light Company closed a contract to-day to furnish for the Union Cold Storage and Warehouse Company, of Chicago, 300 lights. This is the second increase.

The Knapp Electrical Works report large sales and a steadily increasing demand for Grimshaw wire; large shipments lately received gives them a good stock of all sizes.

The Demand for "Okonite" is so great in the Southwest that the Gate City Electric Company, of Kansas City, are unable to receive it fast enough through the Central Electric Company who have the agency for the West.

Among the Late Novelties placed on the market by the Franklin Electric Company, of Chicago, is a new design of cigar lighter. This lighter has no cord connection with the torch, the spark being made by placing the metal brush on the torch held by the statue, thus completing the circuit between the shell and torch point. The sale of these torches is controlled by the Roper & Baxter Cigar Company.

The Chas. D. Jenney Electric Company, of Indianapolis, are enlarging their factory and placing new machinery. All motors placed on the market by this company have given the best of satisfaction.

The Kester Electric Motor Company, of Terre Haute, Ind., have just completed patterns for an arc motor which they will soon place on the market. Many superior points are claimed for it.

The Excelsior Electric Company closed the following contracts the past week: City of St. Charles, Mo., 90 arc lights, the machines must be in place and the lights in operation by April 1st, according to the contract; Murphyboro, Ills., Electric Light and Water Company, one 30-light arc machine and one 650-alternating Ft. Wayne dynamo.

D. B. D.

Chicago, Jan. 4, 1890.

PERSONAL.

Prof. Geo. Forbes, of London, is in the city, stopping at the Windsor.

Mr. R. J. Steen has taken charge of the New York office of the Cobb Vulcanite Wire Company, and will make his headquarters at 45 Broadway.

Mr. C. A. Coffin, vice-president and manager of the Thomson-Houston Electric Company, of Lynn, Mass., has sent to Mayor Newhall, of Lynn, a check for $1,000 to aid the fire sufferers.

Mr. S. M. Hamill has been elected secretary of the Brush Electric Company, succeeding W. F. Swift, deceased. Mr. Hamill is an able and progressive young man and will win fresh honors in this responsible position

Telephonic News

*** Work on the new telephone line between Bridgeport, Conn., and New Haven is at last completed.

*** A number of new telephone lines are being put in Haverhill, Mass., by the Glass Transmitter Telephone Company.

*** What is said to be the longest telephone line on the European continent has just been opened between Prague and Buda-Pesth—600 kilometres being the distance.

*** "Yes," said the telegraph lineman, "I have been a great traveller in my day. I have travelled from one pole to another hundreds of times, and have been in all sorts of climbs."—*Life*.

*** A wondering rustic upon first having explained to him the principles of the telephone exclaimed, "Taint possible," said he; "why that blamed wire don't seem big enough to have a hole clean through the whole length of it!"

*** The Pacific Bell Telephone Company of San Francisco, Cal., has applied to the Superior Court for an order of dissolution. The application recites that at a meeting of stockholders held on December 13, 1889, it was resolved by a two-thirds vote to dissolve the corporation.

*** Linemen in the employ of the Cleveland (Ohio) Telephone Company were at work all day Christmas on telephone wires that had been thrown out of place by the high wind of the night previous. They got the wires in pretty good condition by night, but the high wind again played havoc with them and extensive repairs were necessary the next day.

*** The Metropolitan Telephone and Telegraph Company has been the principal sufferer for the past few days from the industry of the wire cutters, 80,000 feet of their lines being tumbled into the dust of Sixth avenue and West Fourth street to South Fifth avenue. This was done by order of Inspector Fitzpatrick, under "Rule 29," which forbids the existence of all broken or dead wire. The East River Company lost about 35,000 feet of wire. This makes a total for the 13 days of work done up to that time of 770 poles and 227 miles of wire.

An Englishman's Opinion of the English Telephone Service.

I have been so accustomed during my few months here to find accuracy in the editorial portion of your journal, that I desire to correct the "Business Man" you quote as recently asserting that the English and European telephone service is superior to American.

That you may not be found promulgating this policy, let me say, that from a residence in London of some 11 years, ending only on my coming here six months since, I constantly used the telephone in my office, and a more shocking service can hardly be imagined. The Chattanooga service is far and above it in all respects.

The "Business Man," quoted in your edition of Sunday, is wrong again in asserting that in London all wires are underground, including telegraph, telephone, electric lighting and power, for only the telegraph lines (a government monopoly) are all underground. More than half the telephone wires are overhead, not on street poles, but over house tops. The same is true of the electric light wires. They run over house tops; and in some instances these light wires carry 2,500 volts of potential, but the insulation is so perfect that I have never known of anyone being injured.

The telephone rate in London is 20 guineas per year, say $100.

Excuse my intrusion upon you, but as I have become a Chattanoogan, I want to see the *Times* correcting even the New York correspondents.—JOHN H. HASKINS, in *Chattanooga Times*.

"WITH HIS EYES SHUT."

In *Harpers New Magazine* for last month the following interesting article, by Edward Bellamy, is published:

Railroad rides are naturally tiresome to some persons who cannot read on the cars, and being one of those unfortunates, I resigned myself, on taking my seat in the train, to several hours of tedium, alleviated only by such cat-naps as I might achieve. Partly on account of my infirmity, though more on account of a taste for rural quiet and retirement, my railroad journeys are few and far between. Strange as the statement may seem in days like these, it has actually been five years since I had been on an express train of a trunk line. Now, as everyone knows, the improvements in the conveniences of the best equipped trains have in that period been very great, and for a considerable time I found myself amply entertained in taking note first of one ingenious device and then of another, and wondering what would come next. At the end of the first hour, however, I was pleased to find that I was growing comfortably drowsy, and proceeded to compose myself for a nap, which I hoped might last to my destination.

Presently I was touched on the shoulder, and a train boy asked me if I would not like something to read. I replied, rather petulantly, that I could not read on the cars, and only wanted to be let alone.

"Beg pardon, sir," the train boy replied, "but I'll give you a book you can read with your eyes shut. Guess you have'nt taken this line lately," he added, as I looked up offended at what seemed impertinence. "We've been furnishing the new-fashioned phonographed books and magazines on this train for six months now, and passengers have got so they won't have anything else."

Probably this piece of information ought to have astonished me more than it did, but I had read enough about the wonders of the phonograph to be prepared in a vague sort of way for almost anything which might be related of it, and for the rest, after the air-brakes, the steam heat, the electric lights and annunciators, the vestibuled cars, and other delightful novelties I had just been admiring, almost anything seemed likely in the way of railway conveniences. Accordingly, when the boy proceeded to rattle off a list of the latest novels, I stopped him with the name of one which I had heard favorable mention of, and told him I would try that.

He was good enough to commend my choice. "That's a good one," he said. "It's all the rage. Half the train's on it this trip. Wher'll you begin?"

"Where? Why, at the beginning. Where else?" I replied.

"All right. Didn't know but you might have partly read it. Put you on at any chapter or page, you know. Put you on at first chapter with next batch in five minutes, soon as the batch that's on now goes through."

He unlocked a little box at the side of my seat, collected the price of three hours' reading at five cents an hour, and went on down the aisle. Presently I heard the tinkle of a bell from a box which he had unlocked. Following the example of others around me, I took from it a sort of two-pronged fork with the tines spread in the similitude of a chicken's wish-bone. The contrivance, which was attached to the side of the car by a cord, I proceeded to apply to my ears, as I saw the others doing.

For the next three hours I scarcely altered my position so completely was I enthralled by my novel experience. Few persons can fail to have made the observation that if the tones of the human voice did not have a charm for us in themselves apart from the ideas they convey, conversation to a great extent would soon be given up, so little is the real intellectual interest of the topics with which it is chiefly concerned. When, then, the sympathetic influence of the voice is lent to the enhancement of matter of high intrinsic interest, it is not strange that the attention should be enchained. A good story is highly entertaining even when we have to get at it by the roundabout means of spelling out the signs that stand for the words, and imagining them uttered, and then imagining what they would mean if uttered. What then shall be said of the delight of sitting at one's ease, with closed eyes, listening to the same story poured into one's ears in the strong, sweet, musical tones of a perfect mistress of the art of story-telling, and of the expression and excitation by means of the voice of every emotion?

When, at the conclusion of the story, the train boy came to lock up the box, I could not refrain from expressing my satisfaction in strong terms. In reply he volunteered the information that next month the cars for day trips on that line would be further fitted up with phonographic guide books of the country the train passed through, so connected by clock work with the running gear of the cars that the guide book would call attention to every object in the landscape, and furnish the pertinent information—statistical, topographical, biographical, historical, romantic, or legendary, as it might be—just at the time the train had reached the most favorable point of view. It was believed that this arrangement (for which, as it would work automatically, and require little attendance, being used or not, according to pleasure, by the passenger, there would be no charge), would do much to attract travel to the road. His explanation was interrupted by the announcement in loud, clear, and deliberate tones, which no one could have had any excuse for misunderstanding, that the train was now approaching the city of my destination. As I looked around in amazement to discover what manner of brakeman this might be whom I had understood the train boy said, with a grin, "That's our new phonographic annunciator."

Hamage had written me that he would be at the station, but something had evidently prevented him from keeping the appointment, and as it was late I went at once to a hotel and to bed. I was tired, and slept heavily; once or twice I woke up, after dreaming there were people in my room talking to me, but quickly dropped off to sleep again. Finally awoke and did not so soon fall asleep. Presently I found myself sitting up in bed with half a dozen extraordinary sensations contending for right of way along my backbone. What had startled me was the voice of a young woman, who could not have been standing more than 10 feet from my bed. If the tones of her voice were any guide, she was not only a young woman, but a very charming one.

"My dear sir," she had said, "you may possibly be interested in knowing that it now wants just a quarter of three."

For a few moments I thought—well, I will not undertake the impossible task of telling what extraordinary conjectures occurred to me by way of accounting for the presence of this young woman in my room before the true explanation of the matter occurred to me. For, of course, when my experience that afternoon on the train flashed through my mind. I guessed at once that the solution of the mystery was in all probability merely a phonographic device for announcing the hour. Nevertheless, so thrilling and life like in effect were the tones of the voice I had heard that I confess I had not the nerve to light the gas to investigate till I had induced my more essential garments. Of course I found no lady in the room, but only a clock. I had not particularly noticed it on going to bed, because it looked like any other clock, and so now it continued to behave until the hands pointed to three. Then, instead of leaving me to infer the time from the arbitrary symbolism of three strokes on a bell, the same voice which had before electrified me informed me, in tones which would have lent a charm to the driest of statistical details, what the hour was. I had never before been impressed with any particular interest attaching to the hour of three in the morning, but as I heard it announced in those low, rich, thrilling contralto tones, it appeared fairly to coruscate with previously latent suggestions of romance and poetry, which, if somewhat vague, were very pleasing. Turning out the gas that I might the more easily imagine the bewitching presence which the voice suggested, I went back to bed, and lay awake there until morning, enjoying the society of my bodiless companion and the delicious shock of her quarter-hourly remarks. To make the illusion more complete and the more unsuggestive of the mechanical explanation which I knew of course was the real one, the phrase in which the announcement of the hour was made was never twice the same.

Right was Solomon when he said that there was nothing new under the sun. Sardanapalus or Semiramis herself would not have been at all startled to hear a human voice proclaim the hour. The phonographic clock had but replaced the slave whose business, standing by the noiseless water-clock, it was to keep tale of the moments as they dropped, ages before they had been taught to tick.

In the morning on descending, I went first to the clerk's office to inquire for letters, thinking Hamage, who knew I would go to that hotel if any, might have addressed me there. The clerk handed me a small oblong box. I suppose I stared at it in a rather helpless way, for presently he said: "I beg your pardon, but I see you are a stranger. If you will permit me, I will show you how to read your letter."

I gave him the box, from which he took a device of spindles and cylinders, and placed it deftly within another small box which stood on the desk. Attached to this was one of the two-pronged ear trumpets I already knew the use of. As I placed it in position, the clerk touched a spring in the box, which set some sort of motor going, and at once the familiar tones of Dick Hamage's voice expressed his regret that an accident had prevented his meeting me the night before, and informed me that he would be at the hotel by the time I had breakfasted.

The letter ended, the obliging clerk removed the cylinders from the box on the desk, replaced them in that they had come in and returned it to me.

"Isn't it rather tantalizing," said I, "to receive one of these letters when there is no little machine like this at hand to make it speak?"

"It doesn't often happen," replied the clerk, "that nobody is caught without his indispensable, or at least where he cannot borrow one."

"His indispensable!" I exclaimed. "What may that be?"

In reply the clerk directed my attention to a little box, not wholly unlike a case for a binocular glass, which, now that he spoke of it, I saw was carried, slung at the side, by every person in sight.

"We call it the indispensable because it is indispensable, as, no doubt, you will soon find for yourself."

In the breakfast room a number of ladies and gentlemen were engaged as they sat at table in reading, or rather in listening to, their morning's correspondence. A greater or smaller pile of little boxes lay beside their plates, and one after another they took from each its cylinders, placed them in their indispensables, and held the latter to their ears. The expression of the face in reading is so largely affected by the necessary fixity of the eyes that intelligence is absorbed from the printed or written page with scarcely a change of countenance, which when communicated by the voice evokes a responsive play of features. I had never been struck so forcibly by this obvious reflection as I was in observing the expression of the faces of these people as they listened to their correspondents. Disappointment, pleased surprise, chagrin, disgust, indignation, and amusement were alternately so legible on their faces that it was perfectly easy for one to be sure in most cases what the tenor at least of the letter was. It occurred to me that while in the old time the pleasure of receiving letters had been so far balanced by this drudgery of writing them as to keep correspondence within some bounds, nothing less than freight trains could suffice for the mail service in these days, when to write was but to speak, and to listen was to read.

After I had given my order, the waiter brought a curious looking oblong case, with an ear trumpet attached, and placing it before me, went away. I foresaw that I should have to ask a good many questions before I got through, and if I did not mean to be a bore, I had best ask as few as necessary. I determined to find out what this trap was without assistance. The words "*Daily Morning Herald*" sufficiently indicated that it was a newspaper. I suspected that a certain big knob, if pushed, would set it going. But for all I knew, it might start in the middle of the advertisements. I looked closer. There were a number of printed slips upon the face of the machine, arranged about a circle like the numbers on a dial. They were evidently the headings of news articles. In the middle of the circle was a little pointer, like the hand of a clock, moving on a pivot. I pushed this pointer around to a certain caption, and then, with the air of being perfectly familiar with the machine, I put the pronged trumpet to my ears and pressed the big knob. Precisely! It worked like a charm; so much like a charm, indeed, that I should certainly have allowed my breakfast to cool had I been obliged to choose between that and my newspaper. The inventor of the apparatus had, however, provided against so painful a dilemma by a simple attachment to the trumpet, which held it securely in position upon the shoulders behind the head, while the hands were left free for knife and fork. Having slyly noted the manner in which my neighbors had effected the adjustments, I imitated their example with a careless air, and presently, like them, was absorbing physical and mental ailment simultaneously.

While I was thus delightfully engaged, I was not less delightfully interrupted by Hamage, who, having arrived at the hotel and learned that I was in the breakfast room, came in and sat down beside me. After telling him how much I admired the new sort of newspapers, I offered one criticism, which was that there seemed to be no way by which one could skip dull paragraphs or uninteresting details.

"The invention would, indeed, be very far from a success," he said, "if there were no such provision; but there is."

He made me put on the trumpet again, and having set the machine going, told me to press on a certain knob, at first gently, afterward as hard as I pleased. I did so, and found that the effect of the "skipper," as he called the knob, was to quicken the utterance of the phonograph in proportion to the pressure to at least tenfold the usual rate of speed, while at any moment, if a word of interest caught the ear, the ordinary rate of delivery was resumed, and by another adjustment, the machine could be made to go back and repeat as much as desired.

When I told Hamage of my experience of the night before with the talking clock in my room, he laughed uproariously.

"I am very glad you mentioned this just now," he said, when he had quieted himself. "We have a couple of hours before the train goes out to my place, and I'll take you through Orton's establishment, where they make a specialty of these talking clocks. I have a number of them in my house, and as

I don't want to have you scared to death in the night watches, you had better get some notion of what clocks nowadays are expected to do."

Orton's, where we found ourselves half an hour later, proved to be a very extensive establishment, the firm making a specialty of horological novelties, and particularly of the new phonographic time-pieces. The manager, who was a personal friend of Hamage's, and proved very obliging, said that the latter were fast driving the old-fashioned striking clocks out of use.

"And no wonder," he exclaimed; "the old-fashioned striker was an unmitigated nuisance. Let alone the brutality of announcing the hour to a refined household by four, eight or ten rude bangs, without introduction or apology, this method of announcement was not even tolerably intelligible. Unless you happened to be attentive at the moment the din began you could never be sure of your count of strokes so as to be positive whether it was eight, nine, ten or eleven. As to the half and quarter strokes, they were wholly useless unless you chanced to know what was the last hour struck. And then, too, I should like to ask you why, in the name of common sense, it should take twelve times as long to tell you it is twelve o'clock as it does to tell you it is one."

The manager laughed as heartily as Hamage had done on learning of my scare of the night before.

"It was lucky for you," he said, "that the clock in your room happened to be a simple time announcer, otherwise you might easily have been startled half out of your wits." I became myself quite of the same opinion by the time he had shown us something of his assortment of clocks. The mere announcing of the hours and quarters of hours was the simplest of the functions of these wonderful yet simple instruments. There were few of them which were not arranged to "improve the time," as the old-fashioned prayer meeting phrase was. People's ideas differing widely as to what constitutes improvement of time, the clock's varied accordingly in the nature of the edification they provided. There were religious and sectarian clocks, moral clocks, philosophical clocks, freethinking and infidel clocks, literary and poetical clocks, educational clocks, frivolous and Bacchanalian clocks. In the religious clock department were to be found Catholic, Presbyterian, Methodist, Episcopal and Baptist time-pieces, which, in connection with the announcement of the hour and quarter, repeated some tenet of the sect with a proof text. There were also Talmage clocks and Spurgeon clocks, and Storrs clocks and Brooks clocks, which respectively marked the flight of time by phrases taken from the sermons of these eminent divines, and repeated in precisely the voice and accents of the original delivery. In startling proximity to the religious department I was shown the skeptical clocks. So near were they indeed, that when, as I stood there, the various time-pieces announced the hour of 10, the war of opinions that followed was calculated to unsettle the firmest convictions. The observations of an Ingersoll which stood near me were particularly startling. The effect of an actual wrangle was the greater from the fact that all these individual clocks were surmounted by effigies of the authors of the sentiments they repeated.

I was glad to escape from this turmoil to the calmer atmosphere of the philosophical and literary clock department. For persons with a taste for antique moralizing, the sayings of Plato, Epictetus and Marcus Aurelius had here, so to speak, been set to time. Modern wisdom was represented by a row of clocks surmounted by the heads of famous maxim-makers, from Rochefoucauld to Josh Billings. As for the literary clocks, their number and variety were endless. All the great authors were represented. Of the Dickens clocks alone there were half a dozen, with selections from his greatest stories. When I suggested that captivating as such clocks must be, one might in time grow weary of hearing the same sentiments reiterated, the manager pointed out that the phonographic cylinders were removable, and could be replaced by other sayings by the same author or on the same theme at any time. If one tired of an author altogether, he could have the head unscrewed from the top of the clock and that of some other celebrity substituted, with a brand new repertory.

"I can imagine," I said, "that these talking clocks must be a great resource for invalids especially, and for those who cannot sleep at night. But, on the other hand, how is it when people want or need to sleep? Is not one of them quite too interesting a companion at such a time?"

"Those who are used to it," replied the manager, "are no more disturbed by the talking clock than we used to be by the striking clock. However, to avoid all possible inconvenience to invalids, this little lever is provided, which, at a touch, will throw the phonograph out of gear or back again. It is customary when we put a talking or singing clock into a bedroom to put in an electric connection, so that by pressing a button at the head of the bed, a person, without raising the head from the pillow, can start or stop the phonographic gear, as well as ascertain the time, on the repeater principle as applied to watches."

Hamage now said that we had only time to catch the train, but our conductor insisted that we should stop to see a novelty of phonographic invention, which, although not exactly in their line, had been sent them for exhibition by the inventor. It was a device for meeting the criticism frequently made upon the churches of a lack of attention and cordiality in welcoming strangers. It was to be placed in the lobby of the church, and had an arm extending like a pump-handle. Any stranger on taking this and moving it up and down would be welcomed in the pastor's own voice, and continue to be welcomed as long as he kept up the motion. While this welcome would be limited to general remarks of regard and esteem, ample provision was made for strangers who desired to be more particularly inquired into. A number of small buttons on the front of the contrivance bore respectively the words, "Male," "Female," "Married," "Unmarried," "Widow," "Children," "No Children," etc., etc. By pressing the one of these buttons corresponding to his or her condition, the stranger would be addressed in terms probably quite as accurately adapted to his or her condition and needs as would be any inquiries a preoccupied clergyman would be likely to make under similar circumstances. I could really see the necessity of some such substitute for the pastor when I was informed that every prominent clergyman was now in the habit of supplying at least a dozen or two pulpits simultaneously, appearing by turns in one of them personally, and by phonograph in the others.

The inventor of the contrivance for welcoming strangers was, it appeared, applying the same idea to machines for discharging many other of the more perfunctory obligations of social intercourse. One being made for the convenience of the President of the United States at public receptions was provided with 42 buttons for the different States, and others for the principal cities of the Union, so that a caller, by proper manipulation, might, while shaking a handle, be addressed in regard to his home interests with an exactness of information as remarkable as that of the travelling statesmen who rise from the gazetteer to astonish the inhabitants of Wayback Crossing with the precise figures of their town valuation and birth rate, while the engine is taking in water.

We had by this time spent so much time that on finally starting for the railroad station we had to walk quite briskly. As we were hurrying along the street my attention was arrested by a musical sound, distinct though not loud, proceeding apparently from the indispensable which Hamage, like everybody else I had seen, wore at his side. Stopping abruptly, he stepped aside from the throng, and lifting the indispensable quickly to his ear, touching something, and exclaiming, "Oh, yes, to be sure!" dropped the instrument to his side.

Then he said to me: "I am reminded that I promised my wife to bring home some story-books for the children when I was in town to-day. The store is only a few steps down the street." As we went along he explained to me that nobody any longer pretended to charge his mind with the recollection of duties or engagements of any sort. Everybody depended upon his indispensable to remind him in time of all undertakings and responsibilities. This service it was able to render by virtue of a simple enough adjustment of a phonographic cylinder charged with the necessary word or phrase to the clock-work in the indispensable, so that at any time fixed upon in setting the arrangement an alarm would sound, and the indispensable being raised to the ear, the phonograph would deliver its message, which at any subsequent time might be called up and repeated. To all persons charged with weighty responsibilities depending upon accuracy of memory for their correct discharge, this feature of the indispensable rendered it, according to Hamage, and indeed quite obviously, an indispensable truly. To the railroad engineer it served the purpose not only of a time-piece, for the works of the indispensable include a watch, but to its ever vigilant alarm he could intrust his running orders, and while his mind was wholly concentrated upon present duties, rest secure that he would be reminded at just the proper time of trains which he must avoid and switches he must make. To the indispensable of the business man the reminder attachment was not less necessary. Provided with that, his notes need never go to protest through carelessness, nor, however absorbed, was he in danger of forgetting an appointment.

Thanks to these portable memorics it was, moreover, now possible for a wife to intrust to her husband the most complex messages to the dress-maker. All she had to do was to whisper the communication into her husband's indispensable while he was at breakfast, and set the alarm at an hour when he would be in the city.

"And in like manner, I suppose," suggested I, "if she wishes him to return at a certain hour from the club or lodge, she can depend on his indispensable to remind him of his domestic duties at the proper moment, and in terms and tones which will make the total repudiation of connubial allegiance the only alternative of obedience. It is a very clever invention, and I don't wonder that it is popular with the ladies, but does it not occur to you that the inventor, if a man, was slightly inconsiderate? The rule of the American wife has hitherto been a despotism which could be tempered by a bad memory. Apparently it is to be no longer tempered at all."

Hamage laughed, but his mirth was evidently a little forced, and I inferred that the reflection I had suggested had called up certain reminiscences not wholly exhilarating. Being fortunate, however, in the possession of a mercurial temperament, he presently rallied, and continued his praises of the artificial memory provided by the indispensable. In spite of the criticism which I had made upon it, I confess I was not a little moved by his description of its advantages to absent-minded men, of whom I am chief. Think of the gain alike in serenity and force of intellect enjoyed by the man who sits down to work absolutely free from that accursed cloud on the mind of things he has got to remember to do, and can only avoid totally forgetting by wasting tenfold the time required finally to do them in making sure by frequent rehearsals that he has not forgotten them! The only way that one of these trivialities ever sticks to the mind is by wearing a sore spot in it which heals slowly. If a man does not forget it, it is for the same reason that he remembers a grain of sand in his eye. I am conscious that my own mind is full of cicatrices of remembered things, and long ere this it would have been peppered with them like a colander, had I not a good while ago in self-defence absolutely refused to be held accountable for remembering anything not connected with my regular business.

While firmly believing my course in this matter to have been justifiable and necessary, I have not been insensible to the domestic odium which it has brought upon me, and could but welcome a device which promised to enable me to regain the esteem of my family while retaining the use of my mind for professional purposes.

As the most convenient conceivable receptacle of hasty memoranda of ideas and suggestions, the indispensable also most strongly commended itself to me as a man who lives by writing. How convenient when a flash of inspiration comes to one in the night-time, instead of taking cold and waking the family in order to save it for posterity, just to whisper it into the ear of an indispensable at one's bed-side, and be able to know it in the morning for the rubbish such untimely conceptions usually are! How often, likewise, would such a machine save in all their first vividness suggestive fancies, anticipated details, and other notions worth preserving, which occur to one in the full flow of composition, but are irrelevant to what is at the moment in hand! I determined that I must have an indispensable.

The book-store, when we arrived there, proved to be the most extraordinary sort of book-store I had ever entered, there not being a book in it. Instead of books the shelves and counters were occupied with rows of small boxes.

"Almost all books now, you see, are phonographed," said Hamage.

"The change seems to be a popular one," I said, "to judge by the crowd of book-buyers." For the counters were, indeed, thronged with customers as I had never seen those of a book-store before.

"The people at those counters are not purchasers, but borrowers," Hamage replied; and then he explained that whereas the old-fashioned printed book, being handled by the reader, was damaged by use, and therefore had either to be purchased outright or borrowed at high rates of hire, the phonograph of a book being not handled, but merely revolved in a machine, was but little injured by use, and therefore phonographed books could be lent out for an infinitesimal price. Everybody has at home a phonograph box of standard size and adjustments, to which all phonographic cylinders were gauged. I suggested that the phonograph, at any rate, could scarcely have replaced picture-books. But here, it seemed, I was mistaken, for it appeared that illustrations were adapted to phonographed books by the simple plan of arranging them in a continuous panorama, which by a connecting gear was made to unroll behind the glass front of the phonograph case as the course of the narrative demanded.

"But, bless, my soul!" I exclaimed, "everybody surely is not content to borrow their books? They must want to have books of their own, to keep in their libraries."

"Of course," said Hamage. "What I said about borrowing books applies only to current literature of the ephemeral sort. Everybody wants books of permanent value in his library. Over yonder is the department of the establishment set apart for book-buyers."

The counter which he indicated being less crowded than those of the borrowing department, I expressed a desire to examine some of the phonographed books. As we were waiting for attendance, I observed that some of the customers seemed very particular about their purchases, and insisted upon testing several phonographs bearing the same title before making a selection. As the phonographs seemed exact counterparts in appearance, I did not understand this till Hamage explained that difference as to style and quality of elocution left quite as great a range of choice in phonographed books as varieties in type, paper and binding did in printed ones. This I presently found to be the case when the clerk, under Hamage's direction, began waiting on me. In succession I tried half a dozen editions of Tennyson by as many different elocutionists, and by the time I had heard

"Where Claribel low lieth"

rendered by a soprano, a contralto, a bass and a baritone, each with the full effect of its quality and the personal equation besides, I was quite ready to admit that selecting phonographed books for one's library was as much more difficult as it was incomparably more fascinating than suiting one's self with printed editions. Indeed, Hamage admitted that nowadays nobody with a taste for literature—if the word may for convenience be retained—thought of contenting himself with less than half a dozen renderings of the great poets and dramatists.

"By the way," he said to the clerk, "won't you just let my friend try the Booth-Barrett Company's 'Othello?' It is, you understand," he added to me, "the exact phonographic reproduction of the play as actually rendered by the company."

Upon his suggestion the attendant had taken down a phonograph case and placed it on the counter. The front was an imitation of a theatre with the curtain down. As I placed the transmitter to my ears the clerk touched a spring and the curtain rolled up, displaying a perfect picture of the stage in the opening scene. Simultaneously the action of the play began, as if the pictured men upon the stage were talking. Here was no question of losing half that was said and guessing the rest. Not a word, not a syllable, not a whispered aside of the actors was lost; and as the play proceeded the pictures changed, showing every important change of attitude on the part of the actors. Of course the figures, being pictures, did not move, but their presentation in so many successive attitudes presented the effect of movement, and made it quite possible to imagine that the voices in my ears were really theirs. I am exceedingly fond of the drama, but the amount of effort and physical inconvenience necessary to witness a play has rendered my indulgence in this pleasure infrequent. Others might not have agreed with me, but I confess that none of the ingenious appliances of the phonograph which I had seen seemed to be so well worth while as this.

Hamage had left me to make his purchases, and found me on his return still sitting spellbound.

"Come, come," he said, laughing, "I have Shakespeare complete at home, and you shall sit up all night, if you choose, hearing plays. But come along now, I want to take you upstairs before we go."

He had several bundles. One, he told me, was a new novel for his wife, with some fairy stories for the children—all, of course, phonographs. Besides, he had bought an indispensable for his little boy.

"There is no class," he said, "whose burdens the phonograph has done so much to lighten as parents. Mothers no longer have to make themselves hoarse telling the children stories on rainy days to keep them out of mischief. It is only necessary to plant the most roguish lad before a phonograph of some nursery classic, to be sure of his whereabouts and his behavior until the machine runs down, when another set of cylinders can be introduced, and the entertainment carried on. As for the babies, Patti sings mine to sleep at bed time, and if they wake up in the night, she is never too drowsy to do it over again. When the children grow too big to be longer tied to their mother's apron strings, they still remain, thanks to the children's indispensable, though out of her sight, within sound of her voice. Whatever charges or instructions she desires them not to forget, whatever hours or duties she would have them be sure to remember, she depends on the indispensable to remind them of."

At this I cried out: "It is all very well for the mothers," I said, "but the lot of the orphan must seem enviable to a boy compelled to wear about such an instrument of his own subjugation. If boys were what they were in my day, the rate at which their indispensables would get unaccountably lost or broken would be alarming."

Hamage laughed, and admitted that the one he was carrying home was the fourth one he had bought for his boy within a month. He agreed with me that it was hard to see how a boy was to get his growth under quite so much government; but his wife, and indeed the ladies generally, insisted that the application of the phonograph

* * It is probable that an electric railway will soon be built in Lincoln, Neb.

* * A member of the Keystone Electrical Supply Co. of Erie, Pa., is the inventor of an improved electric motor,

* * The Robinson-Foster Electric Company, of Peabody, Mass., are expected to start up business again under the new management.

* * A large electrical plant designed for furnishing electric power to manufacturing concerns at Binghampton, N. Y., will be erected in the coming spring.

* * It is expected that the belt line electric motor road, to be built at Astoria, Oregon, will be commenced on the 15th inst., and completed by the middle of March.

* * The South Easton (Pa.) Electric Light Company have put in a new 48 horse-power dynamo, to be used in connection with the original one, which is 30 horse-power.

* * Pueblo (Colo.) Street Railroad Company has determined to put in electricity as the motive power in all its lines just as soon as the council will grant it permission to change from horses to electricity.

The Athol-Orange Electric Railway.

The following is an estimate of expense involved in the construction and maintenance of the proposed Athol-Orange (Mass.) electric railway. The expense of equipment is $75,000, divided as follows: Cost of building five miles of road, with 40 steel rails, switchings, joints, etc., $32,500; five miles overhead rail and electric equipment, $10,000; four 30 horse-power motor trucks, $18,000; four close car bodies, $3,200; four open tow cars, $2,500; freight on equipment, $300; car house and necessary turnouts, switches, etc., $3,500; one 80 horse-power generator, $5,000. As to the earnings of the road, it is believed that the road would average at least 800 passengers a day for 10 months, giving $10,800, and the other two months, 1,600 passengers, one way, making the receipts for the year at least $15,600. The running expenses will be: Power for two motors, $10 a day; conductor and motor men, $8 a day; man to clean motors, $1.75; repairs, $3; incidentals, $2, which makes the running expenses $24.75 per day, or $8,000 for the year, and with interest on bonds, $1,750, and $1,000 for repairs, it is believed that there will be a balance of at least 10 per cent. on stock.

Applications of Electric Power.

Messrs. Dowd & La Rue, agents for the Sprague Electric Railway and Motor Company in New York, have recently made some very interesting applications of electric power through the Sprague motor. Among the most important may be mentioned the transfer table in the N. Y. C. and H. R. R. R. yard at the Grand Central depot, New York City, where the making up of trains is performed with a 15 horse-power motor, which is mounted upon a platform, covered with a cab, driving the table from track to track at the will of the man in charge, thus performing the work of a locomotive in a very economical, satisfactory and novel manner.

Also a three horse-power Sprague motor, which is located under the stage of the Union Square theatre, which drives the famous race scene in the "County Fair." Mr. Neil Burgess controls the starting and stopping of the motor by a simple switch located on the side of the stage.

A 15 horse-power motor is also at work in the large store of R. H. Macy & Company, Fourteenth street and Sixth avenue, driving their elevator and 200 or more sewing machines in their upstairs manufacturing department.

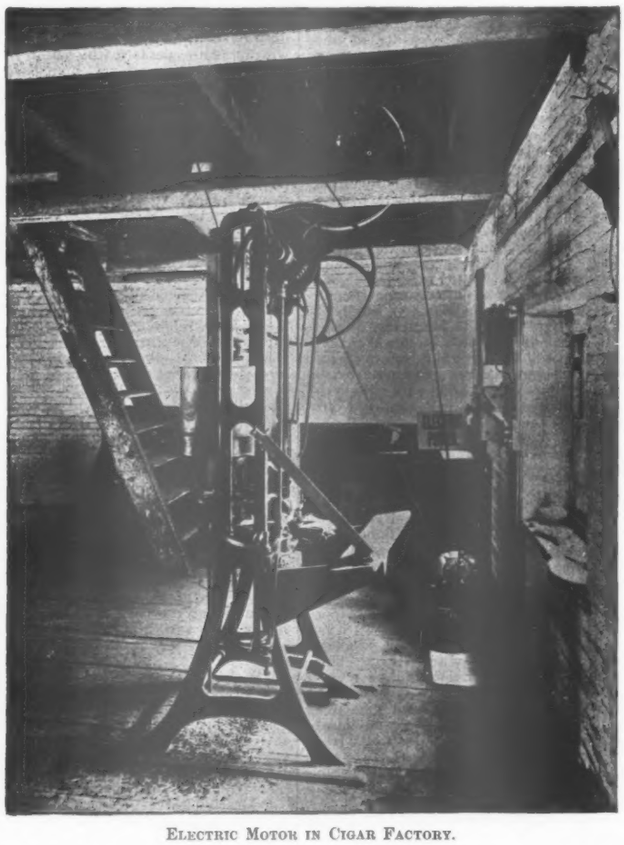
Another application is found at the extensive house of White, Howard & Company, Thirty-fourth street and Madison avenue, where the passenger elevator is driven by a Sprague motor.

Among the many sales made the past week by Dowd & Company, are included one 7½ horse-power Sprague motor, driving the freight elevator for the Perry Stove Company, 74 Beekman street, doing very heavy work, and a handsome ventilating plant for the Third National Bank, Cedar and Nassau streets.

New and wonderful applications of electric power are being constantly made by these gentlemen, who are able workers in the motor field.

Electric Motor Installation.

One of the many motor installations made by the Thomson-Houston Motor Company is shown in the accompanying illustration, made from a photograph of a portion of the



Electric Motor in Cigar Factory.

cigar factory of Wm. Gelpke, Boston, Mass. The motor is employed for operating machinery used in the manufacture of tobacco, one of which is shown in the cut. The motor is also used for running a number of machines on the floor above.

"Electricity in the Tailoring Sphere."

That electricity is fast becoming quite universal in practical use in Minneapolis is evident from the fact that Wyman, Mullin & Co. have just put in an unique electric plant in their factory for the making of overalls, etc. Not only is the electricity used for lighting purposes, but it also runs the shears that do all the cutting and warms the irons that do the pressing. The outfit is the only one of its kind in the country, and works like a charm. It is really said to be more economical than the old method, and a great deal more labor-saving and expeditious. It has attracted considerable attention.—*Minneapolis Pioneer Press.*

* * The Denison Gas Company and the Denison Electric Light and Power Company (Texas) have consolidated, and are both under the superintendency of Mr. John Cullinane, formerly superintendent of the Gas Company of that place.

"WITH HIS EYES SHUT."

(Continued from page 7.)

to family government was the greatest invention of the age.

Then I asked a question which had repeatedly occurred to me that day, "What had become of the printers?"

"Naturally," replied Hamage, "they have had a rather hard time of it. Some classes of books, however, are still printed, and probably will continue to be for some time, although reading, as well as writing, is getting to be an increasingly rare accomplishment."

"Do you mean that your schools do not teach reading and writing?" I exclaimed.

"Oh, yes, they are still taught; but as the pupils need them little after leaving school—or even in school, for that matter, all their text books being phonographic—they usually keep the acquirements about as long as a college graduate keeps his Greek. There is a strong movement already on foot to drop reading and writing entirely from the school course, but probably a compromise will be made for the present by substituting a shorthand or phonetic system, based upon the direct interpretation of the sound waves themselves. This is, of course, the only logical method for the visual interpretation of sound. Students and men of research, however, will always need to understand how to read print, as much of the old literature will probably never repay phonographing."

"But," I said, "I notice that you still use printed phrases as superscriptions, titles and so forth."

"So we do," replied Hamage, "but phonographic substitutes could be easily devised in these cases, and no doubt will soon have to be supplied in deference to the growing number of those who cannot read."

"Did I understand you," I asked, "that the text books in your schools even are phonographs?"

"Certainly," replied Hamage; "our children are taught by phonographs, recite to phonographs, and are examined by phonographs."

"Bless my soul!" I ejaculated.

"By all means," replied Hamage; "but there is really nothing to be astonished at. People learn and remember by impressions of sound instead of sight, that is all. The printer is, by the way, not the only artisan whose occupation phonography has destroyed. Since the disuse of print, opticians have mostly gone to the poorhouse. The sense of sight was indeed terribly overburdened previous to the introduction of the phonograph, and now that the sense of hearing is beginning to assume its proper share of work, it would be strange if an improvement in the condition of the people's eyes were not noticeable. Physiologists, moreover, promise us not only an improved vision, but a generally improved physique, especially in respect to bodily carriage, now that reading, writing, and study no longer involves, as formerly, the sedentary attitude with twisted spine and stooping shoulders. The phonograph has at last made it possible to expand the mind without cramping the body."

"It is a striking comment on the revolution wrought by the general introduction of the phonograph," I observed, "that whereas the misfortune of blindness used formerly to be the infirmity which most completely cut a man off from the world of books, which remained open to the deaf, the case is now precisely reversed."

"Yes," said Hamage, "it is certainly a curious reversal, but not so complete as you fancy. By the new improvements in the intensifier, it is expected to enable all except the stone-deaf to enjoy the phonograph, even when connected, as on railroad trains, with a common telephonic wire. The stone-deaf will of course be dependent upon printed books prepared for their benefit, as raised letter books used to be for the blind."

As we entered the elevator to ascend to the upper floors of the establishment, Hamage explained that he wanted me to see before I left the process of phonographing books, which was the modern substitute for printing them. Of course, he said, the phonographs of dramatic works were taken at the theatres during the representations of plays, and those of public orations and sermons are either similarly obtained, or, if a revised version is desired, the orator re-delivers his address in the improved form to a phonograph; but the great mass of publications were phonographed by professional elocutionists employed by the large publishing houses, of which this was one. He was acquainted with one of these elocutionists, and was taking me to his room.

We were so fortunate as to find him disengaged. Something, he said, had broken about the machinery, and he was idle while it was being repaired. His workroom was an odd kind of a place. It was shaped something like the interior of a rather short egg. His place was on a sort of pulpit in the middle of the small end, while at the opposite end, directly before him, and for some distance along the sides toward the middle, were arranged tiers of phonographs. These were his audience, but by no means all of it. By telephonic communication he was able to address simultaneously other congregations of phonographs in other chambers at any distance. He said that in one instance, where the demand for a popular book was very great, he had charged 5,000 phonographs at once with it.

I suggested that the saving of printers, pressmen, bookbinders and costly machinery, together with the comparative indestructibility of phonographed as compared with printed books, must make them very cheap.

"They would be," said Hamage, "if popular elocutionists, such as Playwell here, did not charge so like fun for their services. The public has taken it into its head that he is the only first-class elocutionist, and won't buy anybody else's work. Consequently the authors stipulate that he shall interpret their productions, and the publishers, between the public and the authors, are at his mercy."

Playwell laughed. "I must make my hay while the sun shines," he said. "Some other elocutionist will be the fashion next year, and then I shall only get hack-work to do. Besides, there is really a great deal more work in my business than people will believe. For example, after I get an author's copy—"

"Written?" I interjected.

"Sometimes it is written phonetically, but most authors dictate to a phonograph. Well, when I get it, I take it home and study it, perhaps a couple of days, perhaps a couple of weeks, sometimes, if it is really an important work, a month or two, in order to get into sympathy with the ideas."

Of the trip out to Hamage's place I recall nothing. I was, in fact, aroused from a sound nap by the stopping of the train and the bustle of the departing passengers. Hamage had disappeared. As I groped about gathering up my belongings, and vaguely wondering what had become of my companion, he rushed into the car, and grasping my hand, gave me enthusiastic welcome. I opened my mouth to demand what sort of a joke this belated greeting might be intended for, but, on second thought, I concluded not to raise the point. The fact is, when I came to observe that the time was not noon, but late in the evening, and that the train was the one I left home on, and that I had not even changed my seat in the car since then, it occurred to me that Hamage might not understand allusions to the forenoon we had spent together. Later that same evening, however, the consternation of my host and hostess at my frequent and violent explosions of apparently causeless hilarity left me no choice but to make a clean breast of my preposterous experience. The moral they drew from it was the charming one that if I would but oftener come to see them, a railroad trip would not so upset my wits.

The Electric Light Plant in the U. S. Senate.

Senate Mis. Doc. No. 27, is the title of a publication just issued from the government printing office. It is dogmatical, controversial, sentimental and electrical. It contains some able papers by prominent men, bristling with pointed arguments, brilliant with light on electric problems, and exhibits the usual assortment of dead dogs in the foreground. Some of the papers have become familiar as projectiles, offensive and defensive, in the high-low tension warfare. The names of ex-Gov. Cornell, Dr. Van der Weyde, Edison, Westinghouse, are conspicuous. The documents have been printed for the use of the Senate in an investigation which is to be made with a view of deciding whether the alternating current lighting system which has been in use in the building for a year past shall be retained or removed. Shortly after it was installed the Edison Company cautioned the government against the dangers attending its use and forwarded a batch of well known letters as evidence of the danger. The opposition made prompt response with numerous papers. The architect of the Capitol made some preliminary examination of the subject and, towards the close of the session, Senator Ingalls, president *pro-tem* of the Senate, started an inquiry on his own account and requested Commander Bradford, of the Navy, to make an investigation and report his conclusions, privately, to him. The main points of this report were printed in the REVIEW last winter. It is now given out in full. It is made to embrace the following topics:

(1) Safety, efficiency and comparative merits of the system used.

(2) Cause of the noise or hum, frequently heard when the electric lights in the Senate chamber are in operation.

(3) Particular recommendation in regard to lighting the Senate Chamber.

(4) General recommendations in regard to lighting the entire Senate wing of the Capitol and terrace.

Commander Bradford, after describing the plant, which included about 1,100 sixteen candle-power lamps, and 28 converters, gave a brief, non-technical description of the alternating system and stated that it is essentially advantageous for lighting points requiring circuits some miles in length, but, when the circuits are short, the advantages cease to exist. He says: "So far as the Senate wing of the Capitol is concerned, I am of the opinion that a due interest for economy does not require the use of the Westinghouse system therein, and therefore other reasons must be sought as to whether it is for the best interests of the government to retain or move the present plant. * * * * The danger to life from receiving what is commonly termed a shock of electricity depends almost entirely upon the pressure of the current. Advocates of the alternating system frequently claim that the alternating current is as safe as the direct. The weight of opinion, however, is greatly in favor of the assertion that it is considerably more dangerous. Just what is a safe or dangerous pressure of the two systems is a matter of controversy between electricians. It is pretty well settled, however, that a pressure of 100 volts of an alternating current, or 200 volts of a direct current are safe. It is also admitted by all that a pressure of 1,000 volts, alternating current, is very dangerous, and if taken through the body, will kill. As it is possible to get a shock of this pressure from the plant now installed in the Senate wing, there is an element of danger connected with it that should be avoided if possible."

In regard to fire, Mr. Bradford quotes the rules of the New England Insurance Exchange, the Phœnix Fire Office and the Society of Telegraph Engineers and Electricians, of London, and states that "the installation in the Senate wing does not approximate even to the requirements for safety of any of these authorities, and this constitutes, in my opinion, a very grave objection to it, and is alone a sufficient reason why it should be removed." On the subject of efficiency, he says: "The Westinghouse system, when operating all of the lamps in circuit, is fairly efficient and economical as compared with other systems. When, however, there are converters that are idle or have only a portion of their lamps in operation, as will always be the case in the Capitol, the system is not an economical one. This is chiefly due to magnetic causes and remains constant without regard to the load or number of lamps in operation; when the number is small it is obvious that the percentage of loss is large. This question is so well understood by the advocates of the alternating system that, in some instances, entirely separate circuits are run for day and night service in order to do away with idle converters. * * * The noise or hum resembling a musical note, frequently heard, is generated in the converters. It is inherent to the system and may be expected to appear at times wherever and whenever converters are employed. It does not occur in the direct system."

The report states that it is perfectly feasible to light the Senate chamber with electricity, and makes pertinent suggestions as to the best arrangement of lamps, etc.

In regard to lighting the entire Senate wing Commander Bradford says "that about 4,100 sixteen candle-power lamps are necessary. This does not include the libraries, in which there are no lights now. To light these brilliantly will require about 1,000 additional; to light them fairly well about 650. In the first estimate 250 are allowed for the Supreme Court room, which will not light it brilliantly, and this is not considered necessary, as the court adjourns at four P. M., and artificial light is only required to help out the daylight on dark and cloudy days. I recommend the installation of a plant of about 3,250 candle-power. I am prepared to recommend the system I deem best for the purpose, but if competitive bids are to be asked for, it may be best to omit this recommendation. Such a plant, not including fixtures, can be installed in a manner which would meet my approval for the sum of $60,000. * * * * I observed when examining the basement some dead arc light wires. Arc light wires ought not to be permitted to pass through the building and these should be removed as a source of danger from lightning, etc. Both arc light and alternating current wires interfere with the free action of telephones. There is a great mass of tangled wires in the basement that should be gathered together in cables or gutters before the building is installed with electric lights, both for safety and efficiency."

The most pointed criticism on this Senate lighting plant is the article in the December number of the *North American Review* by Mr. Westinghouse. It seems particularly unfortunate that so excellent a system as that of the Westinghouse Company should have been so badly constructed, in the most prominent place in the government establishments, by inexperienced workmen not under its control, and especially that, after it was put in operation it should have fallen under the management of a corps of talented, high-priced lawyers It is understood that the officials are endeavoring to get into direct communication with the Westinghouse Company and, if this is done, it is probable the matter can be satisfactorily cleared up. The real question at issue is not so much the advantages or disadvantages of the alternating system as it is the condition of the particular plant under investigation which is, in no sense, a fair representation of that system, and its faults should not be charged up against the plan of incandescent lighting by high tension currents.

The Duluth Electric Light Company.

The Duluth Electric Light and Power Company, of Duluth, Minn., has had a year of wonderful growth, having added to its plant two 750 sixteen candle-power incandescent dynamos of the Westinghouse alternating current system, purchased the lot and building where it first located on Michigan street, thus doubling the amount of real estate owned by the company, increased its steam appliance by the erection of a large brick stack and by the purchase of another 175 horse-power engine and a 500 horse-power boiler of the Scotch marine type.

In the prosecution of its business for the year it has paid for labor and construction nearly $60,000, and has wired seven of the finest buildings in the city or the northwest, including Temple Opera and a large number of the most costly private residences; has more than doubled its production of incandescent custom, and is still far behind on its orders for new work, being unable to secure a sufficient supply of material and skilled labor for the rapidly increasing demand for that form of light.

The outlook for the present year is for a still greater increase in electric lighting by this company than even in 1889, but as facilities have grown with the demand, the company will be able to take care of almost any quantity of business. Its paid-in stock is $75,000, almost exclusively held in Duluth. J. F. Patten is president and general manager, and William Burgess is superintendent and electrician.

—— Sixteen people were asphyxiated by gas in Chicago during the year of 1889, but the papers hardly considered it worth while to give the fate of these unfortunates editorial attention. When, however, a lineman meets death on the electric wires (through his own want of care, as a rule) he is sure to have a column obituary on the leading page of every newspaper in the country, closing with an impassioned demand that the wires shall be put underground. Is this because death by asphyxiation is too "common" to deserve mention in the papers, we wonder? —*Marquette Mining Journal.*

The Burning of the Pearl Street Electric Light Station.

The large electric light station of the Edison Electric Illuminating Company, corner of Pearl and Fulton streets, New York City, was burned out Thursday morning of last week, the fire causing a damage of at least $200,000. The fire is supposed to have started in the dynamo room, caused by a spark falling into the oil which had been spilled on the floor. Twenty thousand incandescent lamps in the lower part of the city were put out by this fire, but the prompt action of the company in connecting up with some of their other stations in the city furnished light the next day to those using the Edison lights in the lower part of the city.

The Pearl street station was the first one built by Mr. Edison in this country, and was the one where he made his first experiments in incandescent lighting, and proved the success of his ideas in the electric lighting field. With the burning out of the station disappears one of the historic electric landmarks.

The fire was discovered about 7 o'clock in the morning by the watchman, and it spread so rapidly over the floor and up the walls, on account of the oil, that the dynamos and the walls were in a blaze instantly, and although the fire department responded promptly it was too late to save the building, and their efforts were devoted to preventing the fire from spreading.

All the other stations of the Edison Company in this city, and in Brooklyn and Philadelphia, are said to be fire-proof. This old station it was expected would be rebuilt this year. There was a fair insurance on the station.

—— The contract between the Charleston Light and Power Company and the city of Charleston for 100 arc lights begun on the 1st of January. The contract is for the year, at $10,000.

—— The State House at Columbia, S. C. is being wired up for arc and incandescent lights. Okonite wire is being used, and the work is under the charge of Mr. A. F. McKissick, the superintendent of the Congaree Gas and Electric Company.

—— The Fort Edward Electric Light and Power Company have filed two certificates with the Secretary of State at Albany, N. Y., one amending the by-laws of the company by providing the number of directors of the company be five, to serve one year, and the other certificate showing the capital stock of the company, of $12,000, has been paid in full.

—— Mr. George Westinghouse announces in a recent newspaper interview that his company is about to supply New York City with a new system of arc electric lighting which will be free from danger. Method consists of main currents underground, each lamp to be operated therefrom by an induced current, just sufficient for itself, and harmless to any person coming in contact with it. The lamp to be used is also an entirely new one.

—— The Paris Exposition was lighted by the following: Alternating current, 165 Jablockoff candles, 50 arcs of 8 amperes, 1,400 incandescent lamps of 7, 10, 32, 100 and 200 candle-power direct current; 138 arcs, 5, 8, 16 and 25 amperes; 275 incandescents, 10 and 16 candle-power. The whole representing an installation of 273,812 candle-power. The central station for furnishing current for these lights was on the edge of the river Seine on the left of the Pont de Jena and it occupied an area of about 6,000 square feet.

—— The Westinghouse Electric Company secured contracts for alternating current apparatus during the first three weeks of December for the following central stations: Salem, O., 750 lights; Louisville, Ky., 750 lights; Greenfield, Mass., 750 lights; Denison, O., 500 lights; St. Louis, Mo., 2,500 lights; Hamilton, Ont., 1,500 lights; Denver, Col., 3,000 lights; Pittsburgh, Kan., 750 lights; Pueblo, Col., 750 lights; McKinney, Tex., 500 lights; Portland, Ore., 6,000 lights; Lynchburgh, Va., 750 lights; Dansville, N. Y., 500 lights; Batavia, N. Y., 750 lights; Pittsburgh, Pa., 3,000 lights; Oldtown, Me., 750 lights. Arc light machines of a capacity of 250 lamps were sold as follows: Pittsburgh, Kan., 50; Portland, Ore., 100; New Bedford, Mass., 100.

ELECTRIC LIGHT NEWS

—— The incandescent electric light is now in general use at the town of Denison, Tex.

—— A new circuit of 40 incandescent lights will be added to the plant at Pittsfield, Mass.

—— The York, Neb., Electric Light Company is putting in many improvements in their machinery.

—— The new electric light company at Beverly, Burlington county, N. J., intends erecting a large building.

—— The Hamburg, N. Y., Water and Electric Company will increase its capital stock from $12,000 to $50,000.

—— The electric light company, of Fremont, Ohio, has purchased the Fremont Gas Company, the consideration being $75,000.

—— The White Plains, N. Y., Gas and Electric Light Company is about to increase its capital stock to $150,000 so as to extend its plant.

—— The electric light company will build a three-story brick electric light station a Omaha, Neb. The Thomson-Houston system is used.

—— Electric lights have been adopted to such an extent in the cities and towns of Guatemala, Central America, that the importation of mineral oils has largely fallen off.

—— The Russian Government has appropriated 650,000 francs for inaugurating electric lights aboard the warships comprising the squadron of the Black Sea and Baltic Sea.

—— Manager Jacob W. Miller, of the popular Stonington line of steamers, is making interesting experiments with electric lights for use on steamships when at sea and enveloped in fog.

—— It is reported that the Chinese syndicate that recently shipped an electric lighting plant to Canton, is endeavoring to secure a long term franchise for lighting Hong Kong.

—— The Fresno (Cal.) Trustees have decided to advertise again for a fire alarm system of six boxes. The California Electric Works has sent in a new bid to furnish a system for $3,600, also one for $2,990.

—— An automatic device has been arranged at the electric light station at Manchester, N. H., by Superintendent Whitney, whereby a little bell tinkles when a circuit breaks in the day time. The test is made by the use of a small generator.

—— The Willamette Falls Electric Co. (Cal.) has contracted with the Westinghouse Co. for a plant of 6000 incandescent lights and 200 arc lights. This is the largest incandescent light contract let on the Pacific Coast, and one of the largest in the United States.

—— The Board of Trade of London has, it is stated, received over 300 applications for provisional orders for the electric lighting of various towns in Great Britain, the whole of which if granted will require the sanction of Parliament before they can become operative.

—— Oldtown, Me., is to have an electric lighting plant in operation very soon. The other day a representative of the Westinghouse Electric Company closed an order at that place for a 750-light alternating current dynamo, and this machine will be shipped from Pittsburgh immediately.

—— The electric light company at Lansing, Mich., has ordered a new 150 horse-power engine for their incandescent system. The new engines now in use are so large that the incandescent dynamo cannot be operated with perfect steadiness, and the rapid increase in business demands additional power in any event.

KINDRED INTERESTS

The New York Central Railroad Company has completed the construction of the electric light plant to light the yards of the company, north of the Grand Central Depot. The plant will also furnish power to operate the transfer truck, which carries cars from one track to another. The engines and dynamos, which are to be used for this purpose, have been placed in a new building facing Madison avenue at Forty-fifth street.

The Wainwright Manufacturing Company of Massachusetts have furnished the following electric plants with corrugated copper tube feed water heaters recently: Canada Electric Co., Nova Scotia, 100 h. p.; Edison Electric Light Co., Pa., 300 h. p.; North Attleboro Steam and Electric Co., Mass., 250 h. p.; Marr Construction Co., Mass., 150 h. p.; Lewiston Electric Light and Heat Co., Ill., 75 h. p.; Belfast Electric Light Co., Maine, 100 h. p.; Denver Tramway Co., Col., 400 h. p.; Greensburg Electric Light Co., Ind., 100 h. p.

The Midland Electric Company, of Omaha, Neb., has made an assignment, and A. F. Blundell, general manager of the company, has been appointed receiver by the United States Court. This company has been running for the past seven years and at first did fairly well, but through inexperienced and incompetent management gradually became deeper and deeper in debt until the pressure of claims caused an assignment. There is scarcely a doubt however but that all claims will be paid in full, as the company has a number of outstanding contracts, and the stock on hand if properly handled will cover the indebtedness.

The Ball Engine Company, of Erie, Penna., have made the following shipments during the month of December to electrical companies:

Townsend Electric Light Co., Port Townsend, Wash. ..... one 100 h. p
Atchison Gas & Elec. Light Co., Atchison, Kan. ..... one 125 h. p.
Buffalo Street Ry. Co., Buffalo, N. Y. ..... one 125 h. p.
Haverhill Elec. Light Co., Haverhill, Mass. ..... one 125 h. p.
Trinidad Elec. Light Co., Trinidad, Col. one 100 h. p.
Edison Elec. Illum. Co., Paterson, N. J. one 150 h. p.
The Boulder Elec. Light Co., Boulder, Col. ..... one 100 h. p.
Paterson Elec. Light Co., Paterson, N. J. one 100 h. p.
Ellensburg Elec. Light Co., Ellensburg, Wash. ..... one 100 h. p.
Lebanon Elec. Light Co., Lebanon, Pa one 100 comp.
Citizens' Electric Light Co., Covington, Ky. ..... one 100 h. p.
Athens Gas Light Co., Athens, Ga. ..... one 60 h. p.
Edison Elec. Illum. Co., Paterson, N. J. one 80 h. p.
Poughkeepsie Elec. Light Co., Poughkeepsie, N. Y. ..... one 100 h. p.
Schuyler Elec. Light Co., Hudson, Mich. one 60 h. p
Edison Elec. Illum. Co., Brooklyn, N. Y one 250 comp.
Norwalk Electric Light Co., Norwalk, Ct. one 80 h. p.

In addition to the above list, the Ball Company have filled large orders to numerous business houses and factories about the country.

The Heisler Electric Company.—Since the organization of the Heisler Electric Company in St. Louis, their system of series lighting has become more and more popular, until now, their factory is taxed to its utmost capacity. The company have been constantly increasing their facilities for manufacturing, and are now turning out a large number of machines each week. The lamp department is turning out upwards of 500 lamps per day and still unable to supply the demand. One of the fine features of this system is an automatic switch, which, in case of a break on the mains, instantly throws the entire output of the machine into the resistance box, thereby cutting the current from the mains which can be handled at any point without danger. Another prominent feature of the system is the manner of constructing the stationary armature; in the event of a section burning out, a connection can be made across the burned section which may then be repaired without stopping the machine. The lamps and sockets are all interchangeable and can be placed at any point on the circuit. The company have lately closed a contract to furnish and install for St. Louis parties at Durango, and Aquas Calientes, old Mexico, central stations with an aggregate capacity of 1,200 lights each.

In Favor of the Telephone Company.

The opinion written by Justice Mayham at Albany, N. Y., in the matter of the application of the Hudson River Telephone Company for a temporary mandamus restraining the Watervliet Turnpike Company from using the single trolley system in connection with its proposed electric motor system, until the courts can decide an application for a permanent injunction, was in favor of the telephone company. The Judge gives the leading points at issue in his decision, and decides that the railroad company cannot use its new electric plant in the city of Albany. We extract the following from this decision:

The plaintiff brings his action for a perpetual injunction, and now asks for an injunction order *pendente lite*, on the ground that the acts sought to be restrained in the action will, if permitted to continue during the pendency of the action, produce irreparable injury to the plaintiff.

The parties respectively claim under rights, claimed to have been acquired under legislative grants, either in express terms, or acquired by virtue of their organization as corporations under general laws.

On the 17th of June, 1889, the common council passed a law, or ordinance, entitled, "A law to authorize the Watervliet Turnpike and Railroad Company to erect poles in Broadway and North Ferry streets, and string wires thereon for the purpose of operating electric motors attached to cars." Such act or ordinance permitted the defendant to erect poles, string wires and operate its cars through Broadway and North Ferry streets, by means of electric motors; and the defendants were proceeding to substitute electric motors for horse-power, for the propulsion of cars, when this action was commenced.

The plaintiff was incorporated in 1883 under the provisions of chapter 265 of the Laws of 1848, entitled, "An act to provide for the incorporation and regulation of telegraph companies," and the several acts amendatory thereof, and supplementary thereto, and thereupon established its central office, or exchange, on Broadway, in the city of Albany, the object, purpose and business of which was through the agency of electricity as applied to the telephone to transmit over wires the sound of the human voice and thereby to enable parties at great distance from each other to converse.

From the central office or exchange the plaintiff located wires upon poles placed in the streets of the city, and particularly through Broadway and North Ferry streets, in said city, and by means of such wires and electricity and the machinery attached thereto connected such office with residences, business places and public offices in Albany not only, but with Troy and many other cities, towns and villages at long distances from the central office, and, as appears by the complaints and affidavits, had established and in operation a large and profitable business at large expense, and was, and is by contract required to and did furnish facilities, through said telephone, for communication and conversation by a large number of subscribers, and the plaintiffs insist, and the proof upon this motion establishes, that the construction and operation of the electric motors as a means of propelling the defendant's cars over and through Broadway and North Ferry streets, on lines parallel with and in near proximity to the plaintiff's lines or wires, and near the plaintiff's central or exchange station, obstructs, interferes with and, to a large extent, prevents the plaintiff from carrying on the business of telephoning and transmitting the sound of the human voice by means of its telephone.

That by the methods used by the defendant in applying electricity as a motor, and the large amount of powerful currents employed by the railroad company on wires in close proximity to and parallel with the wires of the plaintiff's on Broadway and North Ferry streets, constant and rapid changes are produced by *induction;* and as the electricity in the defendant's system is discharged upon the wheels and thus into the earth, through which it reaches the telephone wire by conduction, and these currents of induction and conduction from the electric railway cause and produce the injury complained of.

It is quite apparent from the affidavits upon this motion that the plaintiff's business will, by the operation of the defendant's railroad by electricity through Broadway, be seriously interrupted, and the telephone communication will be seriously interfered with, and it is reasonable to suppose that such interference will deprive the plaintiff, temporarily if not permanently, of some of its patrons, thus rendering the injury irreparable, and perhaps, to some extent, the judgment, if plaintiff obtain one, ineffectual; on the other hand it may be said that if the defendant succeeds in the action, it will suffer heavy loss by reason of the interruption of the operation of its railroad, but that loss may in the main be covered by indemnity furnished in plaintiff's bond, which must, as a condition of the injunction order, be made ample to cover the defendant's loss.

In reaching a conclusion that a temporary injunction should be granted on this motion, I have intentionally avoided any discussion or determination of the somewhat new but very important questions involved in this action which should have a careful trial upon the merits and a speedy determination.

An injunction order *pendente lite* should be granted upon the plaintiff filing a bond, or undertaking, in the sum of $10,000, to be approved by a justice of the court, and if desired by the defendant, the plaintiff, as a further consideration, shall stipulate to proceed to take the proofs in this case before a stenographer to be agreed on by the parties or appointed by the court, and bring the case to a hearing upon the proofs so taken, at any regular special term in the third judicial district, or shall take short notice for trial of said action at the January Albany circuit.

Electric Lights in Demand.

The Thomson-Houston Electric Company reports the following sales of incandescent apparatus to central stations:

Sioux Falls, So. Dakota	50
Tuscumbia, Ala	100
Mays Landing, N. Y	400
Portland, Me	500
St. John, Mich	500
Boston, Mass	500
Adams, Mass	500
Middlesboro, Ky	300
Seymour, Conn	500
Langhorn, Pa	500
Plymouth, Mass	500
E. Greenwich, R. I	850
Oswego, N. Y	1,300
Hyde Park, Mass	1,300
Andover, Mass	650
Winchester, Md	650
Somerset, Ky	650
Watertown, N. Y	650
Catskill, N. Y	650
Rochester, N. Y	650
Huntington, Pa	650

The same company reports the following sales of arc and incandescent apparatus for isolated plants:

ARC.

Allentown Rolling Mill, Allentown, Pa	18
L. F. Bartlett, E. Saginaw, Mich	18
Pioneer Mining and Manufacturing Company, Thomas, Ala	37
Merrimac Manufacturing Company, Lowell, Mass	45
G. F. Blake Manufacturing Company, E. Cambridge, Mass	30

INCANDESCENT.

E. A. Gyde, E. Saginaw, Mich	35
National Transit Company, Kane, Pa	100
National Transit Company, Parker Landing	100
Water Works Building, Detroit, Mich	100
St. Clair Hotel, Cincinnati, O	100
Louisville Chair Company, Louisville, Ky	100
J. O. Shoup & Co., Dayton, O	1,600
Norfolk Woolen Company, Norfolk, Mass	50
Wadsworth, Howland & Co., Malden, Mass	50
J. W. Ayer, Brewer Village, Me	50
Allentown Rolling Mill, Allentown, Pa	200
White Cycle Company, Westboro, Mass	100
Midgely Wire Belt Company, Beaver Falls, Pa	100
Locke Bros., Salem, Mass	200
Woodrough & McFarlan, Cincinnati, O	200
H. A. Marston, So. Framingham, Mass	200
Eastern Manufacturing Company, Brewer, Me	200

The Thomson-Houston Electric Company reports the following sales of arc apparatus to central stations:

Lowell, Mass	25
Rochester, N. Y	50
St. John, Mich	30
Camden, Ark	30
City of Chicago, Ill	210
Chicago, Ill	100
Litchfield, Ill	50
Fairhaven, Washington	30
Chattanooga, Tenn	100
Toledo, O	50
W. Superior, Wis	50
Cincinnati, O	200
Macon, Ga	100
Pottstown, Pa	50
Spokane Falls, Wash	100
Huntington, Pa	50
Bedford, Md	50
Long Branch, N. Y	100
Wilkesbarre, Pa	50
Austin, Minn	50
Weymouth, Mass	60
New Haven, Conn	50
Missoula, Mont	50
Cedelia, Mont	100

The Lighting Department at Indianapolis.

The big fight in 1890 in the city of Indianapolis, Ind., will be between electricity and gas. According to the records it cost in 1888 to light the city the sum of $65,602.82; the old $25 per lamp rate was in vogue half of that year. Since the first of January last a number of gas lamps have been dismantled nearly 400. There are 2,260 street lamps, and in January there will be over 100 electric lights and 300 vapor lamps. The following is the city clerk's account of the expense of lighting the city for 1889:

Street lights, gas, etc	$39,748 76
Station House, gas	393 15
Removing lampposts, etc	81 75
Vapor lights	4,338 00
Electric lights (11 months)	5,638 49
Total	$50,200 15

—The East End Electric Light Company, of Pittsburgh, Pa., which was supplied with the first dynamo of the new Westinghouse arc light system, expresses in a letter to the Westinghouse Electric Company the greatest satisfaction with the dynamo. That machine has a capacity of 60 arc lights and it has been running without a flaw from the moment of starting

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON DECEMBER 31, 1889.

418,198 Method of making collars or axles by electricity; Hermann Lemp and Elihu Thomson, Lynn, Mass.

418,227 Electric exercising machine; Edward W. Robinson, Boston, Mass., assignor to the Electric Exercising Machine Co., Nashua, N. H.

418,248 Electro-magnetic motor; Nikola Tesla, New York, N. Y., assignor to the Tesla Electric Co., same place.

418,249 Lightning arrester; Elihu Thomson, Lynn, Mass.

418,258 Electric railway signal; Edgar C. Wiley, Independence, Va.

418,270 Combined gas and electric light fixture; David J. Braun, Chicago, Ill., assignor to the David J. Braun Mfg. Co., same place.

418,284 Quadruplex telegraphy; Clarence L. Healy, Brooklyn, N. Y.

418,295 Variable-feed mechanism for matrix-making machines; Casper L. Bedfield, Minneapolis, Minn., assignor by mesne assignments, to the Chicago Matrix Machine Co.

418,301 Armature for dynamos; James J. Wood, Brooklyn, N. Y.

418,302 Automatic regulator for dynamo electric machines; James J. Wood, Brooklyn, N. Y.

418,303 Current-regulator for dynamo-electric machines; James J. Wood, Brooklyn, N. Y.

418,322 Electric signal system for letter boxes; Geo. L. B. Rounseville, Chicago, Ill

418,369 Screw-cleat for electric wires; Geo. E. Huff, Hartford, Conn.

418,373 Electric railway; Hosea W. Libbey, Boston, Mass.

418,402 Electric brake mechanism for cars; Wm. H. Darling, New York, N. Y., assignor of two-thirds to Leo Bock, Jr., and Gardner P. Harrington, both of same place.

418,426 Incandescent electric lamp socket; Frank Thone, Oskaloosa, Iowa.

418,443 Mechanical telegraph instrument; Jesse H. Bunnell, New York, N. Y.

418,444 Electric arc lamp; Jesse H. Bunnell, New York, N. Y.

418,472 Electric meter; Chas. A. Pratt, Toledo, Ohio.

418,473 Electric light carbon; Llewellyn Saunderson, Kingstown, County of Dublin, Ireland.

418,483 Secondary battery; Albert E. Woolf, New York, N. Y., assignor to Beuno Loewy, same place.

418,484 Perforating machine; Frank Anderson, Peekskill, N. Y.

418,510 Method of finding the positions of distant objects; Bradley A. Fiske, U. S. Navy.

418,551 Apparatus for the manufacture of gas by electricity; Martin C. Burt, Lake View, Ill.

418,559 Electric meter; Alphonse J. Frazer, Paris, France.

418,602 Governor for steam engines; Louis Bell and William H. P. Creighton, Lafayette, Ind.

418,612 Ocean motor; Isaac St. C. Goldman, Los Angeles, assignor of part to Henry Timken and R. B. Davy, San Diego, Cal.

418,636 Electric light fixture; Geo. C. Baillard, New York, N. Y., assignor to J. H. Bunnell & Company, same place.

418,652 Generation and distribution of electric currents; Francis J. Patten, New York, N. Y.

418,653 System of electrical distribution; Francis J. Patten, New York, N. Y.

418,654 Electric motor; Francis J. Patten, New York, N. Y.

418,655 Distribution of electric currents; Francis J. Patten, New York, N. Y.

418,659 Dynamo electric generator; William Stanley, Jr., Great Barrington, Mass.

418,664 Electro-magnetic type setting machine; William Dreyer, Frankfort-on-the-Main, Prussia, Germany.

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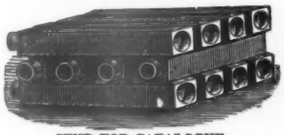

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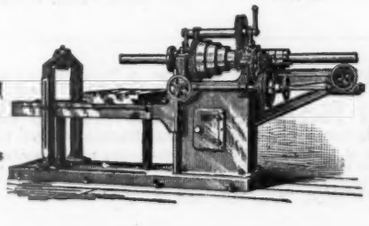

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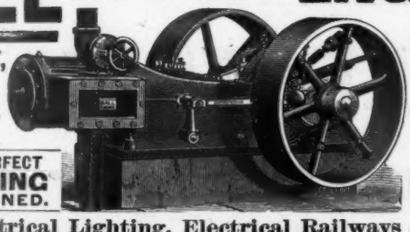

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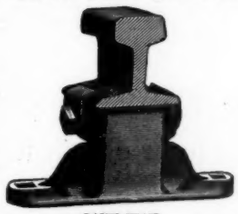

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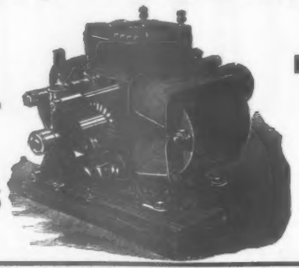

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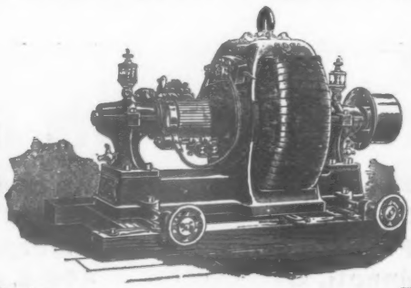

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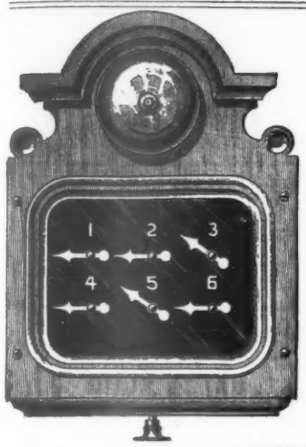

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	X	Y	Z					
A	.....	.....	.....	.....	.....	.....		800
B	8	.....	.....	.....	6.5	1½		530
C	.....	10	.....	.....	6.3	1½		530
D	.....	.....	.....	25	8.0	2		530
E	16	.....	.....	.....	12.0	2½		780
F	.....	20	.....	.....	12.5	2½		780
G	.....	.....	26	.....	13.0	2½		780
H	20	.....	.....	.....	15.0	3		990
I	.....	25	.....	.....	15.6	3		990
J	.....	.....	32	.....	15.0	3		990
K	28	.....	.....	50	16.0	3		990
	.....	.....	.....	.....	21.0	4½		1,360
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	X	Y	Z					
G	.....	35	.....	.....	21.0	4		1,360
C	.....	.....	45	.....	21.0	4		1,360
G	.....	.....	.....	70	21.0	4½		1,360
H	40	.....	.....	.....	29.7	6		1,750
I	.....	50	.....	.....	30.0	6		1,750
J	.....	.....	64	.....	29.5	6		1,750
K	52	.....	.....	.....	38.0	8		2,290
	.....	65	.....	.....	38.6	8		2,290
	.....	.....	83	.....	38.0	8		2,290
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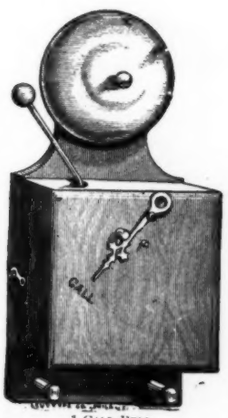

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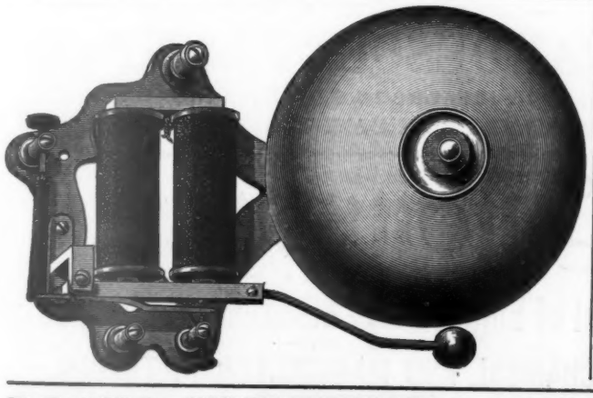

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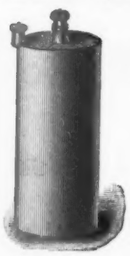
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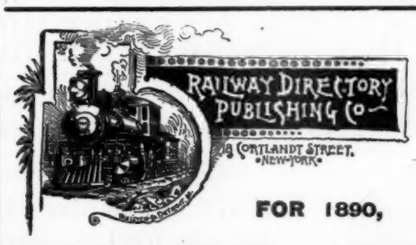

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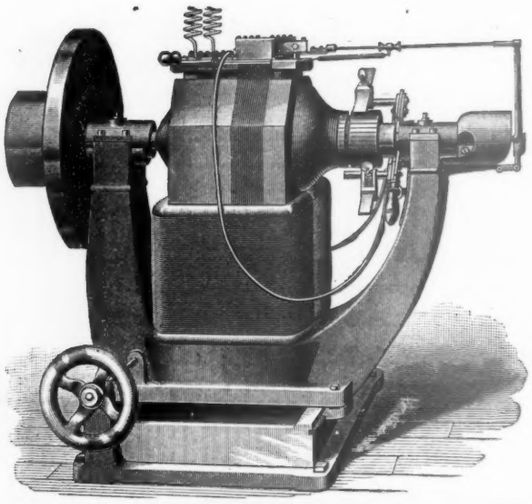

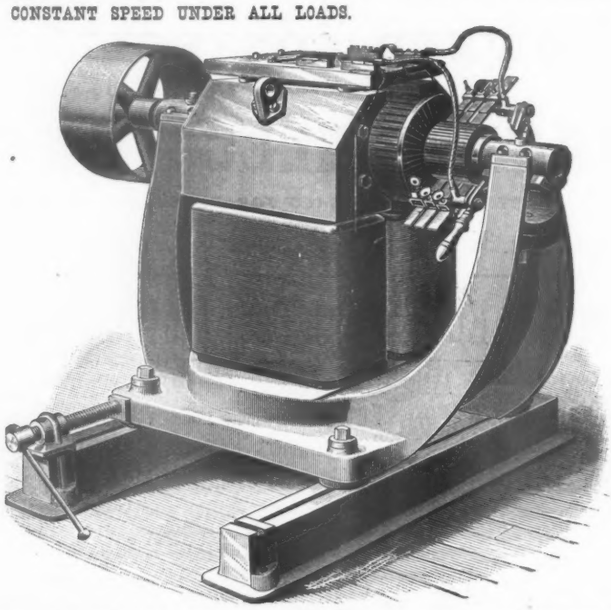

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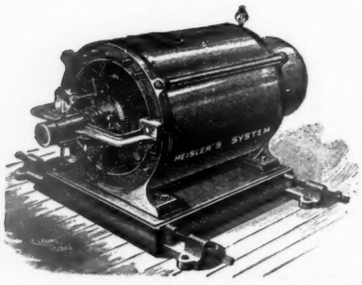

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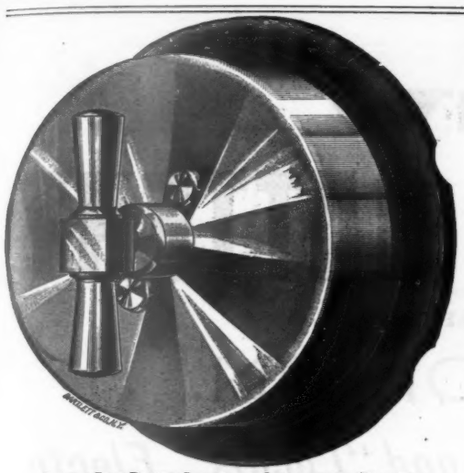

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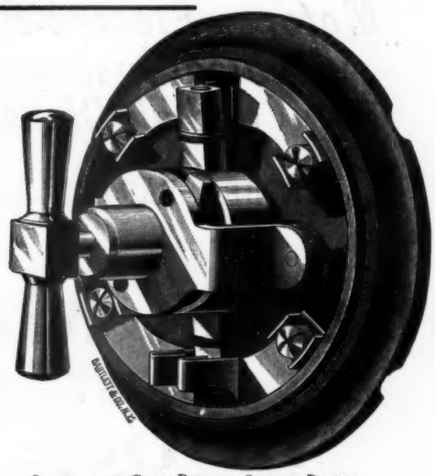

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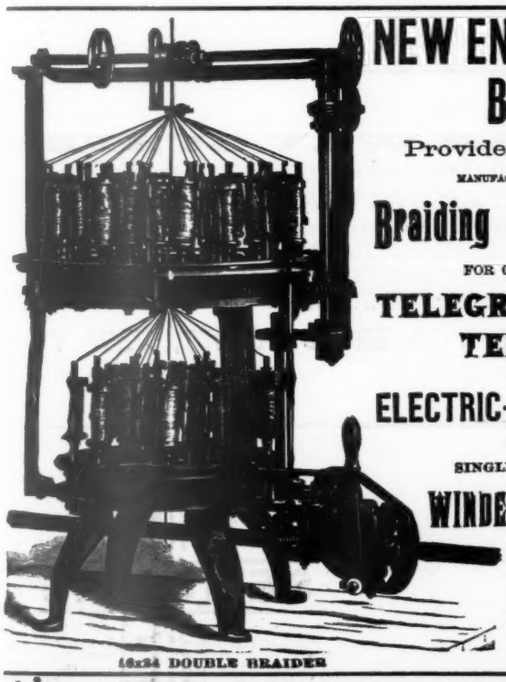

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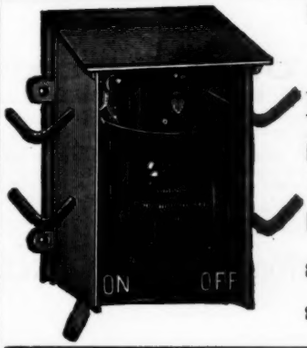

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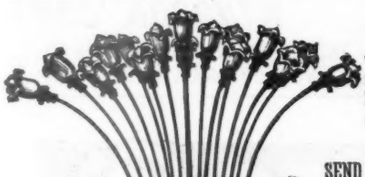

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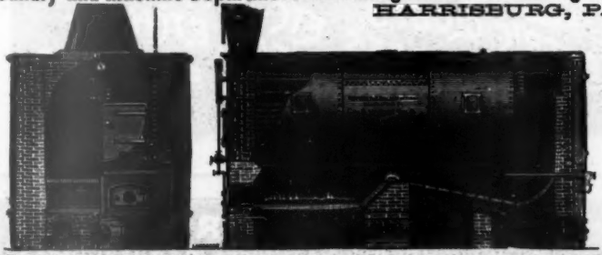

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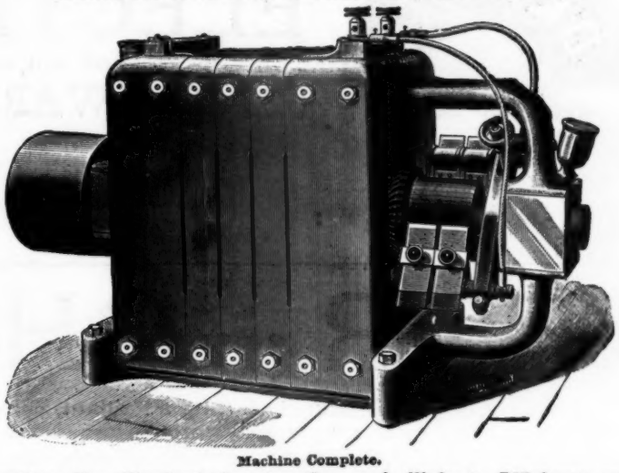

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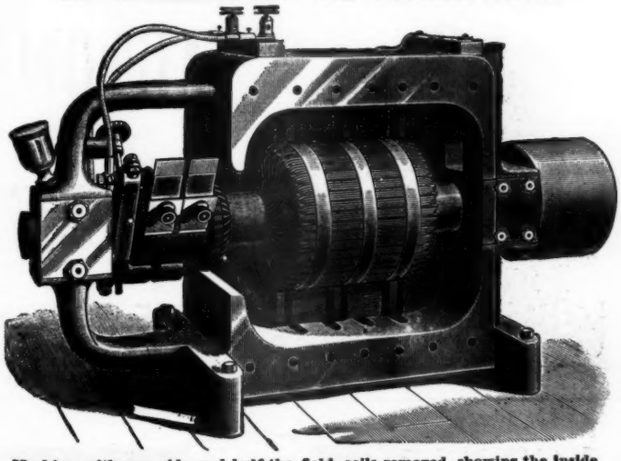

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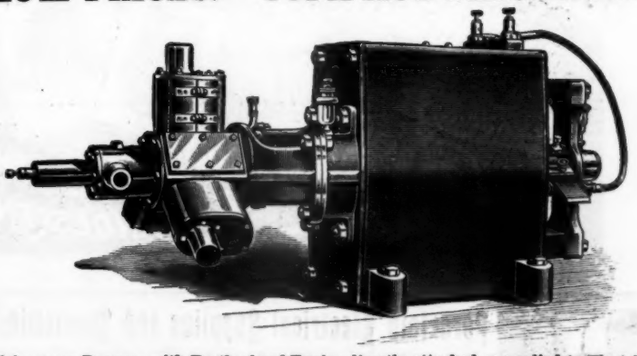

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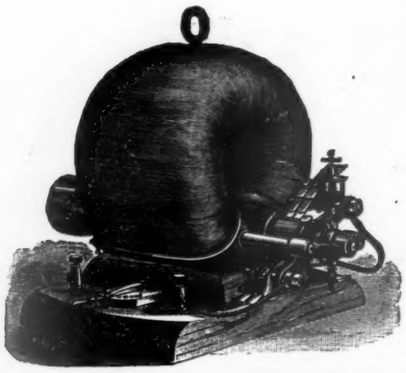

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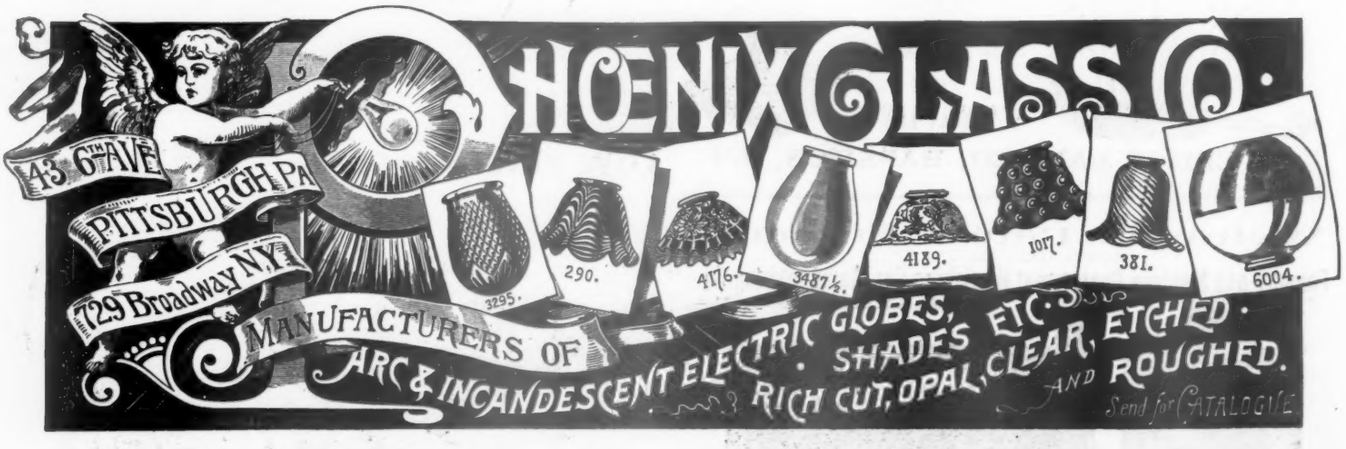
NEW YORK, 33 Church St., BOSTON, 111 Arch St., PHILADELPHIA, 506 Commerce St., CHICAGO, 42 La Salle St., KANSAS CITY, Rialto Building, NEW ORLEANS, 106 Carondelet St.



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Our Ware is HARD PORCELAIN, the BODY and GLAZE IDENTICAL, and GUARANTEED NON-CONDUCTIVE for all ELECTRICAL PURPOSES.

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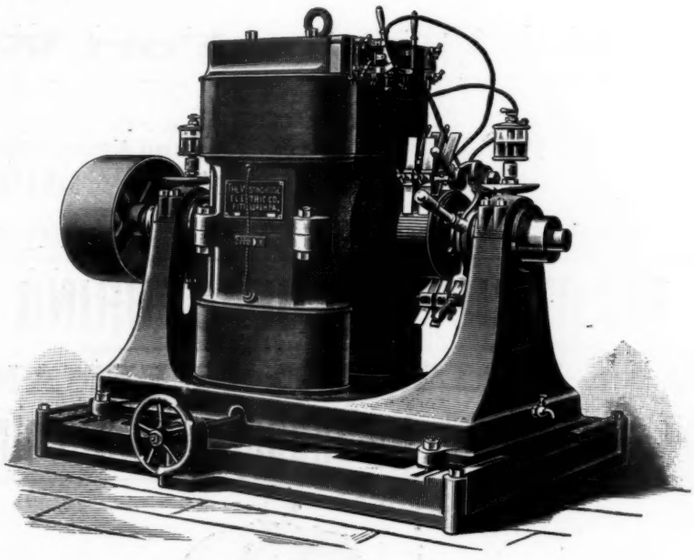

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Fort Wayne Electric Company,

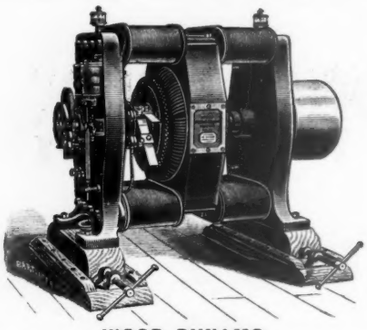
FORT WAYNE, IND.

The most carefully worked out and Complete Alternating System of Electric Lighting in existence.

ARMATURES AND CONVERTERS GUARANTEED.

12 16-candle-power Lamps to the mechanical horse power guaranteed

CORRESPONDENCE SOLICITED.



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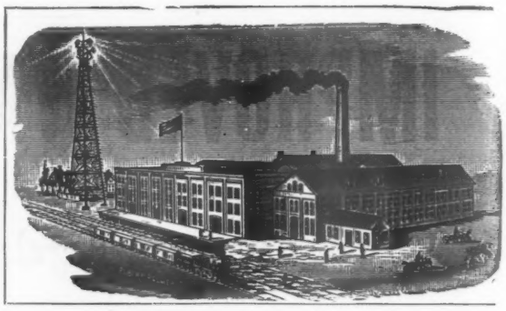

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NEW YORK OFFICE, Rooms 25 and 27, 115 BROADWAY,

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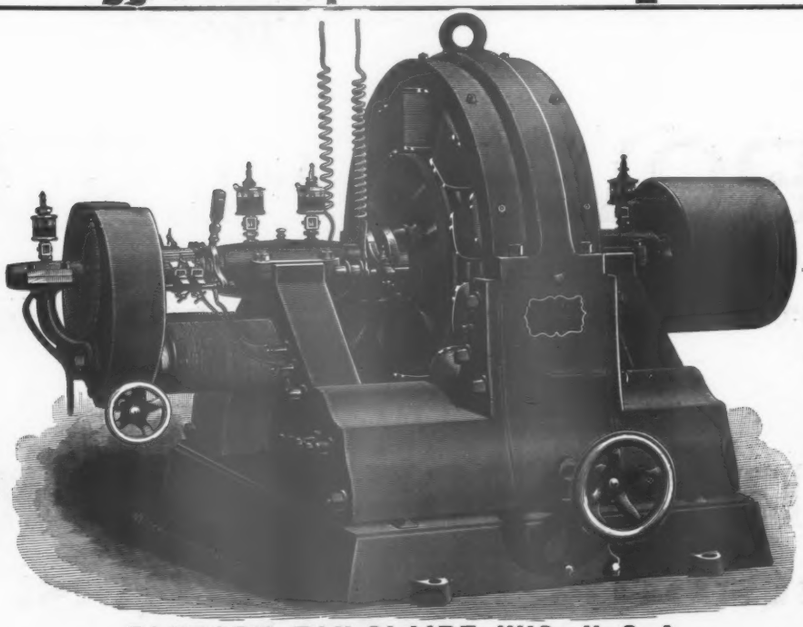

We guarantee our Transformers and Dynamos for two years, and sell our apparatus upon its Satisfactory Performance.

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